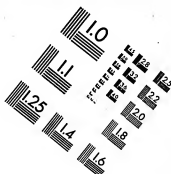
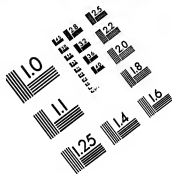




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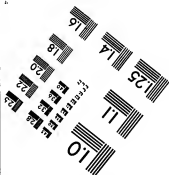
MS303-1980



Centimeter



Inches



# Thomas A Edison Papers

## A SELECTIVE MICROFILM EDITION

### PART II (1879-1886)

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**START**

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THOMAS A. EDISON PAPERS  
A SELECTIVE MICROFILM EDITION  
PART II  
(1879-1886)

REEL 89

MENLO PARK SCRAPBOOK SERIES (SDM-5)  
MISCELLANEOUS SCRAPBOOK SERIES (SBK-2)

#### MENLO PARK SCRAPBOOK SERIES, 1879-1886

The Menlo Park Scrapbooks were begun in 1878 and 1879 by William Carman and Francis Upton. During the 1880s new books were added to the set, and older ones were periodically updated. The first fifty-seven scrapbooks (Volumes 1-40), which were indexed by Edison's staff, have been published in Thomas A. Edison Papers Microfilm Edition, Part I, reels 23-26. The remaining scrapbooks (there were probably about 150 books at one time) contain clippings from the years 1880 and 1881, along with scattered clippings from the years 1882-1889. Most of the books are less than half full, and they relate primarily to technical and scientific matters that were peripheral to Edison's own work.

Only four books, which contain significant material pertaining to Edison's activities, have been filmed: (1) Volume 45 (Cat. 1062), which contains miscellaneous clippings about Edison; (2) Volume 51A (Cat. 1068) and (3) Volume 51B (Cat. 1069), both of which relate to the Edison exhibit at the Paris Electrical Exhibition of 1881; and (4) Volume 67 (Cat. 1085), which deals with Edison's patent litigation and with other patent-related matters.

Most of the clippings in the Menlo Park scrapbooks are from technical and scientific journals, although some are from popular magazines and newspapers. Immediately following is a list of volume numbers and titles, which provides some indication of the variety of subjects found in the scrapbooks. These titles and volume numbers appear on labels attached to the spine or to the inside cover of each book. For scrapbooks with missing or illegible labels, a title has been supplied (in brackets) based on the contents of the book. Volume numbers have also been supplied whenever the number appears on the clippings themselves or when the subject of an unnumbered volume matches that of other volumes at a point where there is a missing number.

<u>Book#</u>	<u>Cat.#</u>	<u>Title</u>
41	1058	Carbon
[42]	1059	[General Scrapbook - Generators]
43	1060	[Spectra and Spectroscopy]
44	1061	Gen. Elect. and Telegraphic Matters, Reviews
45	1062	[Miscellaneous Edison Clippings]
46	1063	Practical Receipts
47	1064	Chemistry (Organic, Technological, Agricultural, Physiological)
48	1065	Mining and Milling
49	1066	Smelting
50	1067	Geology
51A	1068	[Paris Electrical Exhibition]
51B	1069	[Paris Electrical Exhibition]
52	1070	Lamps and Attachments
53	1071	Metals
54	1072	Photometry
55	1073	Photography
56	1074	Meteorology
57	1075	[Biology]
58	1076	Biology
59	1077	[Microscopy; Yellow Fever]
60	1078	Engineering
61	1079	Mathematics
62	1080	Astronomy
63	1081	Mineralogy
64	1082	Zoology
65	1083	Botany
66	1084	Anthropology
67	1085	[Patents and Patent Law]
68	1086	Railroads
69	1087	Glass
70		[Missing]
71	1088	Draughting
72	1089	[Geography]
73	1090	[Telephone]
74	1091	Fibre
75-99		[Missing]
100	1092	General Notions
101	1093	Gen'l Properties of Bodies
102	1094	On Force, Equilibrium, & Motion
103	1095	[Laboratory Apparatus]
104	1096	Laws of Falling Bodies
105	1097	[Physics]
106	1098	[Metalworking]
107	1099	Hydrostatics
108	1100	[Fluids]
109	1101	[Chemistry]
110	1102	[Acoustics]
[111]	1133	Measurement of the Number of Vibrations
112	1103	Apparatus Founded on the Properties of Air
113A	1104	Production, Propagation and Reflection of Sound, Vol. 1
113B	1105	[Production, Propagation and Reflection of Sound, Vol. 2]
114		[Missing]

<u>Book#</u>	<u>Cat.#</u>	<u>Title</u>
115	1106	Vibrations of Stretched Strings and of Columns of Air
116	1107	Vibrations of Rods, Plates, & Membranes
[117]	1108	[Acoustics]
118	1109	Unclassified--Relating to Sound
119	1110	Expansion of Solids
120	1111	Expansion of Liquids
121	1112	[Engines]
[122]	1113	[Physics]
123	1114	Hygrometry
[124]	1115	[Physics]
[125]	1116	[Solar Radiation]
126	1117	Calorimetry
127	1118	Steam, Air, & Gas Engines
128	1119	[Heating and Refrigerating Apparatus]
129	1120	Mechanical Equivalents of Heat
130	1121	Transmission, Velocity, & Intensity of Light
131	1122	[Light]
132	1123	[Optics]
[133]	1124	Dispersion, Acromatism, Inducting Spectroscope
134	1125	Optical Instruments
135	1126	The Eye Considered as an Optical Instrument
136	1127	[Light]
137	1128	[Polarization of Sound]
138	1129	Properties of Magnets
139	1130	Terrestrial Magnetism
[140]	1132	Laws of Magnetic Attraction and Repulsion
141		[Missing]
142		[Missing]
143	1131	[Crystal Palace Exposition]
?	1136	Arc & Incandescent Lamps
?	1137	[Motors]

#### A Note on the Filming of the Menlo Park Scrapbooks

Although each scrapbook page is represented on the microfilm, the contents of the scrapbooks have not always been filmed in their entirety. Many scrapbooks contain oversize clippings that cannot be completely unfolded without obscuring other clippings. Moreover, it is not uncommon for many successive pages in a technical journal to be pasted onto a single scrapbook page. To have filmed the clippings in their entirety would have required several additional reels of microfilm.

Each scrapbook page has been filmed at least once, in such a manner as to convey the greatest amount of bibliographic and substantive information about the clippings on the page. Substantive clippings that are directly concerned with Edison and his inventive or business activities have been filmed in their entirety.

Menlo Park Scrapbook, Cat. 1062

This scrapbook covers the period August 1880-May 1885 and contains clippings relating to electric lighting, electric railways, and ore separation processes. Some of the clippings concern the rivalry between gas and electric illumination. There are also clippings pertaining to Edison's competitors, Hiram S. Maxim and William E. Sawyer. Some of the material is in French, German, and Spanish. The spine is labeled "T. A. Edison. No. 45." The book contains 133 numbered pages.

Blank pages not filmed: 25-26, 29-32, 55-133.

THE REDUCTION RATIO FOR THIS DOCUMENT IS 18:1

**Mr. Wilson Challenged by Mr. Sawyer.**  
**TO THE SENATE OF THE STATE OF NEW YORK.**  
 I HEREBY certify that on the 11th day of January the Hon. Mr. Wilson was  
 challenged by Mr. Sawyer, and that the Hon. Mr. Wilson was  
 sustained by the Senate, and that the Hon. Mr. Wilson was  
 sworn to the office of Senator for the year 1891.

Witness my hand and the seal of the Senate at Albany, this 11th day of January, 1891.

JOHN W. WILSON, Secretary of the Senate.

(Colaboración especial para el Mensajero)

which the Wizard of Electricity pronounced perfect (1).—(Care de J. D. Hasbrouck at antiq. Val

...son sólo días de gracia. Hoy las  
las, y entre muchas cosas, que suelen ser  
muchas más de las que lo parecen.

perdida bien sencilla llama Kristina un telegrama que me pasó por recepción de

...lo que se llama el "arte de la guerra", sino el arte de la guerra.

El día 4 de P. M. estubo a a. con  
el padre. Comenzamos el trabajo ma-  
ñana al amanecer. Pida permiso para

[illegible]

Quinta, *Quinta de San Juan*, por las  
calles de Santiago, San Francisco y la

que iban a unirse con los otros a una  
sede de la familia de los señores de  
una escuela celebrada que hablan pedido

**RECHASÉ!**  
 servísanos a pesar de los churros malitos.

problemas de inversiones norte-americanas, llamadas vulgarmente *joint ventures*, que surgen en cualquier momento en el mundo.

**Excelsior**

---

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Itan y Venian, el caso de una festividad,  
encarnada en la vida humana.

con la ayuda de sus amigos, en un  
no tramo para el futuro (paralelo d  
valader de la ciudad.

de Edison para los teléfonos de Götting, por  
su gran tamaño y en algunos  
casos, 11 metros.

Yo en su pueblo el día del cateo en el campo de batalla, como Velazquez y com.

menos pejos artilleros de la 'esbeleridad'  
tráigalos a New York para e  
obito, looquisme a una buena mujer en

pregnabile, suffragante lacerte, lo quale  
quello significhava la guerra sotto  
de la batte. Ma dila con afabile

los residentes, resultando de las lecciones un abril, ramillete de las paredes en noviembre. Muriendo de las almas.

que todas las cosas nuevas les surcan en el espíritu solo como «creación».

partillegos de alambres: iba a dar una vuelta y salí a esta ciudad profundamente satisfecho y callado. Así se ha sido siempre.

...lo creado, como alabó Pedro de Val-  
leria en Toluca, el ore nativo que

—¡Las calles de Santiago! con vos, con  
arriba, con labias, con amor, con, al di-

corridos: largo y polvoso en las esquinas, "seco" y "guirrotado" entre postrantes bullidos; en una alfombra de alfalfa

de un alfiler almorzando de día por la almata de los maestros y de noche por

1000









12

# RAILROADER.

VOL. III.—NO. 11.

TOLEDO, OHIO, NOVEMBER, 1880.

TEN CENTS PER COPY.

To Train-Boy THOMAS A. EDISON is the world indebted for many useful and wonderful inventions and scientific discoveries. To him does the American public owe the production of the first electric locomotive in practical operation in this country. We here present a spirited picture of the machine, with operators and passengers. On another page, under the head of "Communications," will be found a description of the apparatus, written by C. L. CLARKE, assistant to Mr. EDISON. What part the electric locomotive will play in the railroading of the future is yet a matter of surmise, but that it will have its useful place, if it does not contribute to the revolutionizing of present systems, is most probable.

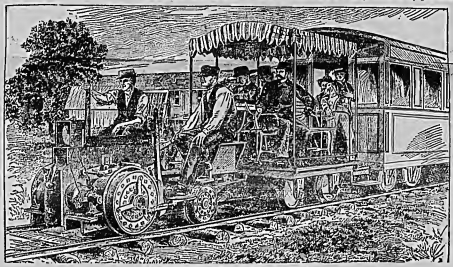
There are sent to Chicago from points east of Toledo ten loaded cars to one to Toledo. This is not simply an assertion. Reliable statistics show this to be the precise situation. No more empty cars of any consequence are handled west, as formerly, and, so Toledo is left without transportation during the season of closed navigation. The large wants of Chicago and tributary territory beyond, occupy all the facilities the existing Companies can, or at least all they do, furnish.

Within ten years Toledo's situation has materially changed. Formerly large numbers of empty cars came here from the east; now the increased wants of far western trade take them

beyond the possibility of being checked in her present prosperous career.

The City's growth and past increase in business cannot continue unless this is done, because conditions have so changed. To these, or to the most important, brief reference only is necessary at this time.

The practical consolidation or extension of three lines from the southeast in Chicago, one passing directly through Toledo, one passing fifty miles south and another ninety miles south, sweeps away a large trade, of which the City formerly had almost an entire monopoly. While it is true that this loss has been fully, perhaps more than compensated for by gain made in



EDISON'S ELECTRIC LOCOMOTIVE.—See page 188.

The proposition to build a new line from Toledo to Buffalo, is one which deeply interests every owner of property here, and is probably the last that will afford a fair opportunity to successfully compete with Chicago and other western rivals. The great present want is more and better outlets to the West, to properly dispose of the large business now centering at Toledo, and if these are not provided the volume of business through this place will not, cannot, increase, but will pass through other points via other routes to the westward. The difficulty does not arise from the unwillingness of lines in operation to accommodate the trade, but from their inability to do so.

The reasons for this may be briefly stated:

nearly all through loaded. The west is using many arteries in largely increased volume over what they formerly did, and this occupies all the transportation facilities, and tends all the while to more and more leave Toledo out of facilities for the eastern movement of her receipts. Toledo's weakness now consists in not being the terminal point of an eastern line, and, unless this is remedied, the need not indulge in any dreams of future greatness, because they will not be realized. Better look things in the face at once, and, relinishing the seriousness of the situation, prepare to meet it in an effective and comprehensive manner; that is, by siding in a substantial way, the building of a new and independent line to the east, thus placing the City

other directions, some turn in railway manipulations may divert the later acquisitions, leaving no chance open to make up for their loss.

We have nothing to say against these considerations; they may have benighted the whole country, but they have benighted many I. caterpillars, and their effect in this way has hardly been felt compared with the way in which it will be within twenty years. Up to the present time they have largely benefited New York and Chicago, and they are slowly but surely grinding out the intermediate points. Toledo's last chance, perhaps, is now open, for self-defense; if she improves it, all may be well; if not she may yet meet the fate of the early cities of the Minnesota Valley.





[illegible][illegible]

TUESDAY, OCTOBER 25, 1900.

But expected Stock Exchange operations on gas stock accompanying the renewed advances that electric lighting is shortly to commence in its universal reign, have been commenced, but without much prospect of equal success in that which attended the general "bearing" campaign of two years ago. A financial conspiracy notice the recent fall in the value of a leading Gas Company's stock, followed immediately by a steady and irremediable recovery, as a sign that, however vigorously the operators for the fall may have rattled the market, there has been no possibility of firing on the partial panic, or, at least, permanent rupture.

own, which thought to bring labor, to their own advantage and the distress of the holders of gas shares. If the authority is question is correct in this assumption, the damage to the general public is great. It is not only the damage among owners and investors in the procreation of the stability of investments in just-stock enterprise. We want expect that gas property will be more exempt than any other from accidental misdeeds of unprincipled speculators. It is not only the damage to the general public, but also as we have assumed on internal interest, the general fluctuation in value of the gas stock in one country being repeated all over the globe. It was permissible to hope that the public would be able to see through the speculators' tricks, quite satisfied by the recent announcements emanating from Mr. Edison, no more effect could be produced from the same cause in England, and this feeling of confidence has, on the whole, been wisely maintained. It is not only the damage to the general public, but also as we have assumed on internal interest, the general fluctuation in value of the gas stock in one country being repeated all over the globe. It was permissible to hope that the public would be able to see through the speculators' tricks, quite satisfied by the recent announcements emanating from Mr. Edison, no more effect could be produced from the same cause in England, and this feeling of confidence has, on the whole, been wisely maintained. It is not only the damage to the general public, but also as we have assumed on internal interest, the general fluctuation in value of the gas stock in one country being repeated all over the globe. It was permissible to hope that the public would be able to see through the speculators' tricks, quite satisfied by the recent announcements emanating from Mr. Edison, no more effect could be produced from the same cause in England, and this feeling of confidence has, on the whole, been wisely maintained.

On Thursday last, as previously, a number of interesting letters on electric lighting was delivered by Mr. J. W. Sizer, who is Mr. T. A. Edison's rival in the production of a light from incandescent carbon in vacuo. We shall give an abstract of the letters on an early date, and our readers will then be enabled to trace the extraordinary resemblance between the prevailing theories of the electric light, and the principle of independent of each other. Mr. Sizer has assigned the priority in point of date, and therefore it cannot be said that the unintentional precedence belongs to the worker on this side of the Atlantic. This is no far satisfaction, as promising an otherwise lively controversy. No one here is likely to fail in finding words at Mr. Edison's expense; but it would remain true that the ingenuity of the latter gentleman would maintain the 22nd of Dick's language. What was the

the true value of either the Swan or the Edison lamp can only be determined by experience, and the sanguine statements of utilitarian inventors are likely to be accepted without further proof of a convincing kind. It is noteworthy that Mr. Swan does not desire the total extinction of gas, even while preparing for it. He, unlike Mr. Edison, sees that the introduction of a new light into the world does not necessarily imply the abolition of any previously known light, unless it be seriously inefficient, and that is a reservation which certainly cannot be held to apply to gas.

One of the paramount advantages to be conferred by electric lighting, when generally adopted, is to be the complete immunity from the loss of life and property by fire and explosion, which is such an objectionable accompaniment to the use of gas. Such, at least, is the contention of the prophets of the new luminary. How far this thrilling promise is likely to be fulfilled we are slowly learning by the dispassionate testimony of facts. In February of the present year we had occasion to notice the death of a handsome artist, near Birmingham, by an electric shock, which had been the consequence of his grasping the connecting wire of an electric lamp while the current was passing. Another victim has now lost his life by the independence of touching an electric lamp with both hands. This time the "accident" happened at sea, on board the *Lithia*, the new yacht of the Empress of Russia, on her passage from the Tyne to Havre. It appears that a sailor was told to hold an electric lamp while it was being swung for lighting the stoke-hole. He obeyed, but in such a manner as to divert the current from the caudex through his own body, and he was instantly stricken dead, as by lightning, the disintegration of the actual tissue by the current being such as to render it necessary to bury the body at sea within twenty-four hours from death. The daily papers break on the impressive nature of the funeral service, but in so far as the public generally the most impressive thing about the melancholy occurrence is the confirmation it affords of the previously recorded fact: that the incontinent handling of an electric lamp may result in death of the awful character always attached to the popular mind to a lightning stroke. Death has often occurred in the past, and may at any time happen to persons who are exposed, by their own act or by the act of others, to the effects of an explosion of gas, or of suffocation by an escape of gas unattended with any explosion; but great recklessness or ignorance must in such cases be exhibited by somebody, and in most instances of the kind there is sufficient warning given to be appreciated by sensible people. In the case of an ignorant which places portable lighting within the reach of an unskilled man who is only doing his duty in holding it, the utter absence of any intimation of the deadly power lying in readiness must be held sufficient to justify the prescription of any apparatus which is not so constructed as to render such deposits such an accident as that on board the *Lithia*.

*The prospects of rapidly upon which gas shows any promise.*  
J. H. A.—It is well advice gas to weigh your word and rate, and shall be glad to hear further from you when you have arrived at some definite results regarding the working of your furnace as compared with the old system.

*Electricity.—"The Plumber and Sanitary Engineer: A Practical Treatise on the Principles of Internal Plumbing Work, or the Best Means for Effectually excluding Noxious Gases from our Homes." By Dr. Simon Holliday. Second Edition. London, R. T. Dutton, 1888.*  
Manufacture of flasks of gas-resisting composition. Water intended for incineration, must be collected by the same and address of the writer; not necessary for publication, but as a guarantee of good faith.

## THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

THURSDAY, OCTOBER 26, 1888.

Circular to Gas Companies.

Two expected Stock Exchange operations on gas stock, accompanying the renewed assurances that electric lighting is shortly to commence its universal reign, have been commenced, but without much prospect of equal success to that which attended the general "bearing" campaign of two years ago. A financial correspondence notices the recent fall in the value of a leading Gas Company's stock, followed immediately by a steady and irrepressible recovery, as a sign that, however vigorously the operators for the fall may have rattled the market, there has been no possibility of forcing on the partial panic, or, at least, permanent depression.

pretended, and are in answer not down than they reap, always to find some fresh believers, and always to be met with the same combination. It is due to the interest of the community no less than to their own credit, that gas men should be able to demolish old fallacies in the matter of artificial illumination, and shew the weak points of new ones. And besides the duty of dealing with individual and definite causes of disturbance such as we have indicated, the general confidence of gas proprietors in their investments is by all means to be maintained by instructing them, whenever occasion serves, in the nature and possibilities of gas in all its ramifications, so that whenever a few street-lamps are lit up by electricity the risk of a panic, or the internal perturbation which leads to a panic, and which is essentially a result of ignorance, may be much diminished, if not altogether removed.

On Thursday last, at Newcastle, a most interesting lecture on electric lighting was delivered by Mr. J. W. Swan, who is Mr. T. A. Edison's rival in the production of a light from incandescent carbon in vacuo. We shall give an abstract of the lecture on an early date, and our readers will then be enabled to trace the extraordinary resemblance between the proceedings of the two inventors, carried on, of course, in perfect independence of each other. Mr. Swan has slightly the priority in point of date, and therefore it cannot be said that the unintentional copying belongs to the worker on this side of the Atlantic. This is so far satisfactory, as preventing an otherwise inevitable controversy. No one here is likely to indulge in hard words at Mr. Edison's expense; but it is not so certain that the friends of the latter gentleman would refrain from all imputations against Mr. Swan if caught imitating the Menlo Park luminary. What may be



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TO CORRESPONDENTS.

- 1. It is requested that the information for which you ask, be sent to the Editor of the Journal of Gas Lighting, Water Supply, and Sanitary Improvement, 10, Abchurch Lane, London, E.C. 4.
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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

THURSDAY, OCTOBER 22, 1903.

Circular to Gas Companies.

THE expected Stock Exchange operations on gas stock, accompanying the renewed assurance that electric lighting is shortly to commence its universal reign, have been commenced, but without much prospect of equal success to that which attended the general "bearing" campaign of two years ago. A financial contemporary notices the recent fall in the value of a leading Gas Company's stock, followed immediately by a steady and irresponsible recovery, as a sign that, however vigorously the operators for the fall may have assailed the market, there has been no possibility of forcing on the perfunctory panic, or, at least, permanent depression,

which they sought to bring about, to 1902-03. The authority in question is correct in this assumption, the discounting of a gambling game is a fit subject for congratulation among every one interested in the preservation of the stability of investments in joint-stock enterprises. We cannot expect that gas property will be more caught than any other from occasional rales of unprincipled speculators, especially as it has grown of late years into such importance as to have assumed an international interest, the general fluctuations in value of the gas stock in one country being repeated all over the globe. It was paradoxical to hope that as the price of gas shares in the New York market remained quite unaffected by the recent announcements emanating from Mr. Edison, no more effect would be producible from the same cause in England, and this feeling of confidence has, on the whole, been amply justified. There has been no widespread depreciation in Metropolitan or other gas stock, and the particular instance taken by our contemporary for the text of a hoist on the folly of attempting to force (Gas Companies, say, on the first of it, to do so in special cases. Still, the fact of speculators having a voracious eye on the high positions at which gas shares ordinarily stand, and the certainty that an opportunity of snatching a profit in speculation with sudden and violent fluctuations in the value of the stock of securities will be ever looked in, sufficient to induce vigilance on the part of those who are equally interested in maintaining them at their normal value. This can, of course, only be done by forcing, as it were, every fresh cause of possible disturbance in the minds of timid Proprietors, and taking care that persons interested on one side do not have all their own way. All gas engineers and responsible officials connected with public or private gas undertakings, must be careful to inform themselves clearly and fairly respecting any new form of electric lighting or other covered source of gas, great or small, in order that they may be at all times ready to correct the popular accounts and glaring misstatements which are always wherever public attention is directed to anything new, or, especially new, of the kind. And it should always be remembered that nothing of this nature, however insignificant, can be safely "pooled" by those who can or ought to be able to dispose of it by convincing argument. The ignorance of the general public on technical matters is profound, and commensurate with this ignorance is the liability to take alarm at shadows and less than at the most portentous realities—the propensity to believe in the solidity of any share, at least for a time, especially if the fabric of the imposture be principally newspaper. The silence of an illusion is no guarantee that it will fail to impose on some few people each time it is permitted. It may be that a small-headed electric lamp is a revival under a new name of some long-forgotten device; or it may even be a startling proposal to make gas out of sawdust, or of old bones. All such schemes are in their nature pernicious, and are no sooner put down than they reappear, always to find some fresh believers, and always to be met with the same condemnation. It is due to the interest of the community the less than to their own credit, that gas men should be able to demolish old fallacies in the matter of artificial illumination, and detect the weak points of new ones. And besides the duty of dealing with individual definite causes of disturbance such as we have indicated, the general confidence of gas Proprietors in their investments is by all means to be maintained by instructing them, whenever occasion serves, in the nature and possibilities of gas in all its manifestations, so that whenever a few street-lamps are lit up by electricity the risk of a panic, or the harmful perturbation which leads to a panic, and which is essentially a result of ignorance, may be such diminished, if not altogether removed.

On Thursday last, at Newcastle, a most interesting lecture on electric lighting was delivered by Mr. J. W. Swan, who is Mr. T. A. Edison's rival in the production of a light from incandescent carbon in vacuum. We shall give an abstract of the lecture on an early date, and our readers will then be enabled to trace the extraordinary resemblance between the proceedings of the two inventors, carried on, of course, in perfect independence of each other. Mr. Swan has slightly the priority in point of date, and therefore it cannot be said that the unintentional copying belongs to the weaker on this side of the Atlantic. This is so far satisfactory, as preventing an otherwise inevitable controversy. No one here is likely to indulge in hard words at Mr. Edison's expense; but it is not so certain that the friends of the latter gentleman would refrain from all imputations against Mr. Swan if caught initiating the Menlo Park mystery. What may be

[illegible]

RECEIVED BY THE Publisher, and Sent to the Editor: A Practical Treatise on the Principles of Internal Planning Work, or the Best Means for Effectually confuting Noxious Gossip from our Members. By E. S. S. Smith. Second Edition. London, E. T. Balfour; 1861.

[illegible][illegible]



## DISON'S WORK

GETTING READY FOR A BIG EXPERIMENT.  
PREPARING TO OPERATE HUNDREDS OF LAMP  
THROUGH EIGHT MILES OF WIRE--WIRE TO BE  
LAIN IN NEW YORK IN JANUARY--CRITICISM

[illegible][illegible][illegible][illegible][illegible][illegible]

The World N.Y. Nov. 2 1880  
The world  
N.Y. Monday Nov 5 1880  
1880. 1880

HOW FAR EOISON HAS GOT.

Proposing a Test in a Fortnight and to Begin Operations in New York in January or February.

Mr. Edison is working very hard at Menlo Park, even devoting himself a large amount of sleep. He told a *Western* reporter yesterday that he would "be satisfied to show the public in a fortnight." "I am not," he said, laughing, "a poor, weak old man, as I have been called; I am strong. I have a chance to judge for themselves what I can do," he continued as he pointed to some of his experiments at candle lamps. "Last night I was out. First, when I told what I was going to do,

[illegible]

from waiting for action upon the bill. "I think it is better to have the bill passed now than to have it passed later," he said. "I think it is better to have the bill passed now than to have it passed later," he said. "I think it is better to have the bill passed now than to have it passed later," he said.

Identify this (Nov)  
 1944  
 The composition of this compound for  
 relief of human pain reminds us of a  
 prescription we once saw presented as -

Myxus's counsellor, in which the ingredients were opium, lamianum and myrrhine. The Myxusian was presumably intoxicated when he wrote the formula, and it was fortunate for him that he was, for he was not a doctor. He wrote for himself and the patient that the dose was small enough not to render it dangerous to be "sekru so directed."

Mr. Edlinson's "greatest discovery," as Myxus has been styled, seems to be based on the principle that if one thing isn't another will; and to avoid the repetition of experiment, he proposes to give you all at once. So his formula comprises any compoised every steelethic known to man.

we are extremely interested, the following is the recipe for polyform—Mr. Edson's greatest discovery."

"1 ounce hydrate of chloride.  
4 ounces alcohol.  
2 ounces chloroform.  
2 ounces camphor.  
2 ounces oil of peppermint.  
2 ounces oil of clove.  
3 pennyweights of salicylic acid.  
3 pennyweights nitrate of soda.  
2 pennyweights of morphine sulphate.  
2 ounces of ether."

That those proportions may be varied, and of course, used in many other ways.

[illegible]

5-1988 20

is permitted, all the other ingredients be left out on occasion, and the data developed accordingly.

By the way, it would be a good exercise for the students of the College of Pharmacy given out from the above formula the proper doses for the greatest discovery.

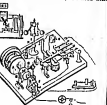
The number of ingredients in this remarkable composition of matter, and the grounds claimed in their corresponding, is equivalent in the so-called Merck's Index, which, as a specimen of infidelity, has hitherto stood unchallenged in the libraries of the U. S. Patent Office.

## THE ELECTRICIAN

### EXTRACTS OF SPECIFICATIONS.

DIFFICULTY IN DEMAND ON MAGNETIC MATHEMATICS AND ELECTRICITY  
 (Continued from Page 1) — (Continued from Page 1)

...the latter will be able to stop the hostilities...  
 ...the latter will be able to stop the hostilities...  
 ...the latter will be able to stop the hostilities...

[illegible]

45 Edison's Carbon Lamp.  
Off down the street  
We like to conduct the business

ing," he stated Mr. Edison that he had perceived his great loss, and that he had been so called by his countrymen, wherever he went, as the "man who had brought light into their homes." "The people of New York city; that the gas people's 'days' were 'numbered,' and that his vision was to be held here 'in its honor.'" This is December 1st, and Mr. Edison has been making tours all summer, and has accumulated several thousands of them, we trust he will make the light a complete success in December, 1879, and a great promise. We will record his future career, and his self-education, and his life, as Mr. Edison has earned the reputation of being an exceedingly uncertain kind of person, we have not yet become a philosopher, although he seems to have been in the "theology of ideas and actions which guided him in January 1879."—The Operator.

One Sanitary Engineer, Aug. 14. 1877.

It is stated at the new steamship, City of Worcester, built for the Norwich line, is to be fitted up with 300 of the Edison electric lamps. As "entire dependence is not placed on the new system of lighting," the mowers will be fitted up for gas and will in addition to the electric lamps.

*Industrial News, Jan'y, 1887.*

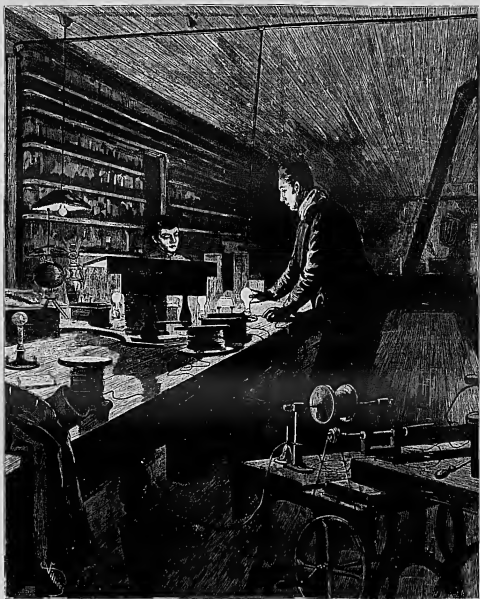
The editor of the *Manufacturer and Builder* says: "Those who may have concluded, from the absence of newspaper discussion of the subject, that Mr. Edgerton's venerable Mr. Edison had abandoned the problem of electric lighting for domestic purposes, since the latter then took the enthusiasm which his announcements of last winter aroused, may prove to have been mistaken. We threw out this comment from having observed in the latest number of the eminently respectable *North American Review*, an article in which it is announced, on Mr. Edison's authority, that the method of electric lighting with which his name is associated has at length passed the experimental stage, and is now ready for general use."

15 THE ENGINEER Jan 7

An instrument for measuring the amount of electric current flowing through a circuit, as the number of wires that have been supplied, is the subject of a recent patent by Mr. Edison.

Mr. Edison has made application to the Board of Aldermen of the City of New York for a permit to erect a large central electro-dynamic station and to stretch the necessary wires for the general illumination of the lower part of the city by night, and the supply of motive power by day. He is represented by a company, who declare themselves now in entire readiness to compete with the gas companies in the matter of general illumination.

**EDISON.**—The *Brick, Tile, and Metal Review* of March last makes Mr. Edison speak as follows:—“There are 300 small Edison Electric Light companies organized in cities and towns in the United States, with ample capital, prepared to set to work as soon as I give the word ‘ready,’ and within three months 300 machine shops will be working exclusively on material for the Edison light. Each one of these companies will want to be supplied with lamps and machines by me, under my personal supervision, for making the lamps, and of those articles.”



THE ELECTRIC LIGHT—MR. EDISON IN HIS LABORATORY: A SKETCH FROM LIFE

Among the electric light lamps is the "Maxim" similar to the Edison but having the globe filled with vapour of gasoline. It is said to give satisfactory results, the gasoline furnishing carbon with which to automatically repair weak places in the carbon filament, and so preserve it from early destruction.

The original Edison lamp with carbon loop, with which he made his experiment, and with it a certificate under his own hand and in threefold form, as he now is to be seen in the Patent Museum, South Kensington, where the hanging board designates "edison's apparatus."

could be sufficient. *Electrician Jan 1/98*  
 Boston.—Our comie American contemporary, Puck, quotes the following from the *S. F. News Letter*: "Edison, the newspaper electrician, is at it again. This time he announces that he has hit the nail on the head, and the consequences will be a brilliant illumination of the entire earth at a cost not worth mentioning. As a means of producing the incandescence, he uses infinitesimal strands of bamboo, procured at a great expense from Cuba. This new light should be patented under the title of 'Edison's Electric Dandelion.'"

[illegible]

Not long ago, says the newspaper correspondent, "death," all the Examiners of the Electrical Department of the Patent Office were brought up to Merck's plant and shown Edison's light. The patent clerk directed them to the room where there were two things which would work him, his injury. The first would be the gas compressor in despair putting down their noses to fifty cents a thousand or less, so as to understand on the electricity and try to force him off by the full weight of capital. He and he could stand that as long as they could. The next was the possibility that some other inventor might make gas out of water or some cheaper material. "In that case," said Edison, "I have only to go back to my laboratory. I am a professional inventor, and the only problem presented to me is to go and make something cheaper than it is now made, and I do it."

Electrician Jan 1 1871

Electrician Jan 1 '81







When a man is  
in a state of  
excitement  
he is not  
in a state of  
calmness

Mr. Edison, July 1887

Edison's new light

Edison's new light

Don't do it.  
There are some men in this country who are so stupid that they don't see a joke if it is told to them three times. The other day, old Parke went off to an electric street, went to the telephone which connects with the Edison's Van Dusen street, and changing his voice, bellowed:  
"Hello, Mr. Edison, are you asleep?"  
"That you, Mr. Edison?" was the answer.  
"Yes, I am," said the merchant, "and I am not asleep."  
"Well, the old fellow may come home to him presently, but the telephone, my dear Sir, has not been changed yet," said the other man.

The fact of the fact, Edison's new light, is not a joke, it is a fact. Edison's new light, is not a joke, it is a fact. Edison's new light, is not a joke, it is a fact.

Edison's new light, is not a joke, it is a fact.

Mr. Edison has made a great new experiment in the use of the electric light. He has made a great new experiment in the use of the electric light. He has made a great new experiment in the use of the electric light.

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# CLEVELAND Herald-Examiner

A Correspondent Visits  
Edison.

And is Shown Through  
His Workshop.

Something About the Electrical  
Inventor—Reference to the  
Brush Light.

Special correspondence of our paper at  
New York, Feb. 14.—The man tall  
and as the Herald-Examiner reports  
from the inside at Menlo Park was some-  
thing, and the man, it is said, small  
beside may be as robust, presented a dis-  
tinct appearance indeed. According  
to the report which is in the Herald-Examiner  
there, we found that said inventor had  
been chosen for special, or even our  
good reason. Being unable to secure  
accommodations we stayed at one of the  
Edison residences, which had  
been our objective point, when  
starting from New York. An  
American who is in the in-  
charge of Menlo Park's quiet presence,  
said it perhaps well that he went to  
call on the great man in the person  
of Newark, has instead of being  
such a drive after from Newark, on  
the Pennsylvania road, then making it  
twenty-four miles from New York.  
When Edison and his establishment  
Menlo Park would be unknown, if  
there are his very few buildings there,  
which either Edison himself or his  
workmen constructed. When we had  
leaved this month the reason for the  
halt being retired from business was  
three-fourths of a mile we passed out  
way, not appreciating the fact of  
a small building facing the office,  
further by the four-story building  
which was the most magnificent  
modern and pointed with its new  
and its appliances for construction, that  
as there were neither electric, clerks  
nor persons within, we went direct  
to the building which looked with  
fancy, shining and machinery of it,  
looking into the man, rather than  
directed at the man, rather than  
contact with New York, may be  
seen.

Mr. Edison was  
"What," he replied, the inventor  
very close to the man, and he is  
rightly and that the inventor  
conversation would have been  
in a lecture of voice, he was  
always perfectly correct, but he  
never let the other men and himself  
and the other men were not well.

The man who was tall and as the  
Herald-Examiner reports from the inside  
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fancy, shining and machinery of it,  
looking into the man, rather than di-  
rected at the man, rather than contact  
with New York, may be seen.

The man who was tall and as the  
Herald-Examiner reports from the inside  
at Menlo Park was something, and the  
man, it is said, small beside may be  
as robust, presented a distinct appearance  
indeed. According to the report which  
is in the Herald-Examiner there, we  
found that said inventor had been  
chosen for special, or even our good  
reason. Being unable to secure accom-  
modations we stayed at one of the  
Edison residences, which had been our  
objective point, when starting from  
New York. An American who is in the  
charge of Menlo Park's quiet presence,  
said it perhaps well that he went to  
call on the great man in the person  
of Newark, has instead of being such  
a drive after from Newark, on the  
Pennsylvania road, then making it  
twenty-four miles from New York.  
When Edison and his establishment  
Menlo Park would be unknown, if there  
are his very few buildings there, which  
either Edison himself or his workmen  
constructed. When we had leaved this  
month the reason for the halt being  
retired from business was three-fourths  
of a mile we passed out way, not  
appreciating the fact of a small build-  
ing facing the office, further by the  
four-story building which was the most  
magnificent modern and pointed with  
its new and its appliances for construc-  
tion, that as there were neither electric,  
clerks nor persons within, we went direct  
to the building which looked with  
fancy, shining and machinery of it,  
looking into the man, rather than di-  
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rected at the man, rather than contact  
with New York, may be seen.





[illegible]

Quantity of gold  
From the *1864*  
Published at *1864*

## NEW YORK LETTER

**An Interview With the Wizard  
of Maple Bank**

Thomas A. Edison, the Remarkable Re-  
sults Investigator—A Plan to Tele-  
graph From One Ship to An-  
other at Sea—Other Wonders

Special Correspondence of the Enquirer and Advertiser  
NEW YORK, May 13.—Last week I talked with a Beetham. This week I have conversed with Thomas A. Edison in his laboratory. When the greater part of the city is asleep, when graveyards yawp—though why they should be addicted to yawning I cannot say—they have no harder work than snoring and snoring to fall asleep: when respectable children have naught to do, and gamblers and criminals, together with people of extreme fashion who startle into paroxysms, begin the sweetest part of their life; then it is that the most remarkable of record will find its level.

We make our way down to a certain corner of Arena B, where a huge torch-burning stands unresponsive in the midst of the nocturnal darkness. It would appear dead but for a glimmer or two of light in the highest story. According to a preposterous plan, we knock at the big door and are admitted by a sleepy youth who carries a lantern. "You'll find a light on the next floor," he says, reassuringly, and forthwith lets us in through the trap or *sewer* of the woodwork compartment which forms the office. We clamber up two half-lighted north-wooden stairs, find the alcove just as

[illegible][illegible]

of cattle and horses immersed in brackish water. The animals were found dead or nearly dead from lack of oxygen. The water was so shallow that the animals could not reach the surface to breathe. The water was also very warm, and the animals were found in various stages of decomposition. The water was also very shallow, and the animals were found in various stages of decomposition. The water was also very shallow, and the animals were found in various stages of decomposition.

... rapidly sketched in papers, and of the two costumed and the Atlantic, and illustrated his plan of telegraphing from ship to ship so as to establish certain connections between the two oceans, and of the frequency of the service. Not content with this projected scheme, which seems to be near the fulfillment, he is also busy upon improvements in sailing vessels, and in the construction of a new class of vessels of reckoning, which would be high class by the flicker of a flame thrown upon a mirror is a strikingly interesting illustration of the principle of the new design. The number of digits indicating letters often has to be reduced by operations from the length of time that the flame is visible. In this, the shipboard telegraph is far superior to the one used by one or two of the new codes, is not questionable, although it marks the due proportion. - Edison is trying to make a new, improved

of speed that the record may be made clearer. But "it's tough," he says.

At the time, the young man told me he had to say I was rejecting his explanation for a "new force." At present he calls it simply a "new force." He is not sure of the name, but he is sure that there are many phenomena which are not explained by any force yet recognized, and that it is these which he is going to explain. He has a number of theories, but the most important one is that the vibrations of matter at the rate of 30,000 a second produce the highest sound we can hear. Between those and the vibrations which, at the rate of 100,000 a second, produce the light of the heat lines in a large lamp; and between these and the vibrations that give sensation of color in the light of the sun, and the vibrations of the nerves, are filled by vibrations as yet unrecognized, which constitute the new or unnamed force. He says that the vibrations of the ether are a slower sound, now known only because it has produced a number of machines he has produced. He says that the vibrations of the ether are a slower sound than they occur to me," he said.

"And when I get enough of them together I can make the machines made and say to you that I have found the new force."

—THOMAS EDISON, as told in the historical story of his life.

[illegible][illegible]

100





[illegible]

1911

1911

consulte sur la taille face de la coupe  $\frac{1}{2}$   
Alicia Clark, Alt-division  
allait sur elle

— La conception est ecclésiologique. L'ave-  
nement du Christ est le commencement d'une  
nouvelle ère, celle du Royaume de Dieu. Le  
Christ est le Seigneur et Sauveur de l'humanité  
entière. La mission de l'Église est de proclamer  
l'Évangile à tous les hommes, de les convertir  
et de les baptiser. La liturgie est le cœur de  
la vie de l'Église, le lieu où le Christ est  
présent et où il agit. La liturgie est le lieu  
où le peuple de Dieu se rassemble pour  
adorer Dieu et pour vivre ensemble.  
La liturgie est le lieu où le Christ est  
présent et où il agit. La liturgie est le lieu  
où le peuple de Dieu se rassemble pour  
adorer Dieu et pour vivre ensemble.

— Mais, culture  
toit être munit

— Mieux, répondit fraternellement Edouard, je vous le dis : prenez garde qu'en la faisant à son insu, elle ne se livre à quelque acte de désobéissance.

— Mais, une telle créature ne sera jamais qu'une poutre sans intelligence!

A cet effet, l'ind. Ewald démissionne comme bapard devant Edison. On est allé qu'il se pait, pour comprendre ce que un propo-sail l'été d'été.

**Préliminaires d'un Prélude**  
(Suite)

estimation plus sûre qu'il renouelle tous les sept ans un assemblée d'...

LE PACTE

# LIVE INOV EDDIE

**TRÈVE NOUVELLE**

**00 30 0031248E 1859**

vous ne pouvez  
vous le permettre  
vous le permettre  
vous le permettre

Le muraliste se reforma.

... ..

... d'habitudes de VRAIE FRANÇAISE ! Ceux-ci l'embellissent.

— Vous ne saurez, même jamais justifier l'acte de Dieu.

— Mais enfin, s'écria lord Bernal, moi, je compte aussi pour quelque chose dans mon amour !

— Ceci fait partie du problème et me répond. Et puis, *l'esprit serait incapable d'être autre* : si elle ne s'accommodait-elle d'un tel état ?

— Mlle Alicia Gray ne consentira jamais, d'ailleurs, à se prêter à cette expérience, et, en effet, j'heurtaiis moi-même, le 15 août, à 5 heures, au moment où elle se levait, le mur de la porte.

— Mon cher lord... heur, vous sentez bien qu'il est raisonnable, puisqu'il vous l'estime !

vous et moi-même, nous avons vingt, cinquante ou cent ans. De cet état d'urgence, des formes de violence ont surgi, et il en est qui m'effraient quand j'en parle. Je ne suis pas sûr que l'humanité puisse résister à ce que l'impensé de votre état m'a bouleversé : je vous en suis sûr.

— Je vous le répète, mon cher, gentils et républicains, le jeune homme, c'est lui, votre fils, qui a été le premier à se lever, à dire : « Vive la République ! »

**Exofoliar:** *Exfoli* nous mantes les mailles !  
Mises à jour et ventes à la volée !  
Jusqu'à 200000 visiteurs !

IV

A ce mot tiré, lord Ewald ne comme pétrifié devant Financière. To deux se regardèrent en silence. — E

— *Une intelligence? Non! L'ignorance!*

— Aussi, ne vous ai-je pas dit d'écouter ça par une femme !... Blaise ! ne poussa-t-il pas de la main et se pencha-t-il vers elle.

I Les pans du voile s'entrechoquent.  
— sous le col autour du gorgeoir de métal :  
— sur les épaules, nouent  
— se répètent sur

**I'VEE NOVVELLH**

FIVRE CINQUITIÈME

**ADAI**

## II

[illegible][illegible]

L'annonce est séparée à la table, mais c'est tout ce qu'on a pu en tirer. Les autres sont restées dans le silence. Les uns regardent les autres, les autres regardent le ciel. Les uns regardent les autres, les autres regardent le ciel. Les uns regardent les autres, les autres regardent le ciel.

... de Lucien Bonaparte. All  
... à de curieuses révélations  
... estimable famille.

Vendédon de BIOLLE FRANÇAIS,  
DU 2 JANVIER 1880

**—**

Oh! mais  
que en

I'VEE NOUVELLE

IVRE D'EXIL

1000

James S. Thompson

[illegible]

Ce diant, li baises tomber, en mourant  
A côté de son âme, s'assit, s'accouda  
Et, d'un air d'homme qui vit, dit, le VOÛT.

[illegible][illegible][illegible][illegible]

100



**Menlo Park Scrapbook, Cat. 1068**

This scrapbook covers the period April-December 1881 and contains newspaper clippings and other material relating to the Paris Electrical Exhibition of 1881. Many of the clippings describe the exhibits of Edison and his competitors. Also included are guide leaflets, information bulletins, and official notices concerning the exhibition. Much of the material is in French. The front cover is labeled "Paris Exposition Scrapbook." The spine is labeled "T. A. Edison. No. 51." The book contains 144 numbered pages.

# INTERNATIONAL EXHIBITION OF ELECTRICITY AT PARIS.

August 1 to November 16, 1881.

## CIRCULAR TO AMERICAN EXHIBITORS.

### DEPARTMENT OF STATE.

WASHINGTON, D. C., March 24, 1881.

The President of the United States, in the absence of any special provision by Congress for the representation of the United States, has appointed an Honorary Commission, under the charge of a Commissioner General and an Executive Commissioner.

This Commission will be the official channel of communication between the American exhibitors and the French General Commission at Paris.

Exhibitors will have to bear all expenses of packing, shipping, and transportation, delivering their exhibits at the Palace of the Champs-Élysées at Paris between the 1st of July and the 1st of August; they will also defray all expenses of installation and immediate care of their exhibits. There will be no charge for space or flooring and but a limited charge will be made for motive power furnished to exhibitors. Insurance is at the option of exhibitors and at their expense. Objects exhibited will be protected against injury of invasions or designs by complying with the French law of May 23, 1868, on the subject. (See Appendix II.)

The General Regulations for the Exhibition, prescribed by the French Minister of Posts and Telegraphs, are hereto annexed, and will supply intending exhibitors with all necessary information.

The time for receiving applications, formerly fixed for March 31, 1881, has been extended in the case of American applications, at the request of the United States Government, until the 16th of May, 1881. Applications for space should be filled up in accordance with the accompanying form, in either French or English, and sent to the Department of State at Washington not later than the 20th of April, 1881, to ensure transmission to the French Commissioner General at Paris in due season.

The shipment of articles for exhibition should be so conducted that they may be delivered at the Palace of the Champs-Élysées, in Paris, between the 1st and the 16th of July. The Acting Commissioner General will endeavor to effect some favorable arrangement with steamship lines for the transportation of goods at lessened expense to the exhibitors, and the duties thereof will be given to all exhibitors whose applications for space have been filed. Information in regard to the usual terms of shipment can be obtained from the United States Dispatch Agent at New York, Mr. Radcliffe Baldwin, No. 53 Broadway. Letters of inquiry addressed to Mr. Baldwin should enclose stamps for pre-payment of return postage.

It is understood that a number of exhibitors have made direct application for space to the French Commissioner General, under the provision of Article 12 of the French Regulations. Care will be taken to ensure that such exhibitors shall be on an equal footing with other American exhibitors, and their interests in like manner protected by the United States Commission.

All communications in regard to the admission of applications and requests for forms, and generally all correspondence in relation to the preparation and exhibition of articles, should be addressed, postage paid, as under. Correspondence for the American Commission in Paris should be addressed to "Mr. George Walker, Executive Commissioner of the United States, United States Consulate General, Paris, France."

Requests for information on any points not covered by this circular or its annexes will be cheerfully answered by the undersigned.

*The Assistant Secretary of State*

Acting U. S. Commissioner General,  
Department of State, Washington, D. C.

### THE UNITED STATES COMMISSION.

THE ASSISTANT SECRETARY OF STATE, Acting Commissioner General,

GEORGE WALKER, Honorary Executive Commissioner,

GEORGE E. GOURAUD, Honorary Commissioner,

CHARLES R. GOODWIN, Honorary Commissioner,

MINISTRY OF POSTS AND TELEGRAPHS.  
INTERNATIONAL EXHIBITION OF ELECTRICITY, PARIS, 1881.

## GENERAL REGULATIONS

## GENERAL PROVISIONS

ARTICLE 1. The International Exhibition of Electricity, authorized by a decree bearing date of October 23, 1880, shall be opened at Paris, at the Palace of the Champs-Élysées, on the 1st day of August, 1881, and close on the 16th day of November, 1881.

ART. 2. The Commission appointed by the decree of November 26, 1880, of which the Minister of Posts and Telegraphs is to be the presiding officer, shall be committed in regard to all measures connected with the general organization of the International Exhibition of Electricity.

ART. 3. The means necessary for the organization and holding of the Exhibition shall be derived from such pecuniary aid as may be granted by the State and by a guarantee association, the subscribing members of which have pledged themselves to claim no profits after the amount of their contributions shall have been repaid to them, with interest at 4 per cent.

When the accounts of the Exhibition shall be settled, the net profits shall (after the payments due to the subscribers of the guarantee capital shall have been deducted) be turned over to the State, which shall apply them, in accordance with the suggestions of the Commission of Organization, to the promotion of scientific enterprises of public interest.

ART. 4. A Technical Committee and a Financial Committee shall be appointed. The Technical Committee shall be composed of members of the Commission of Organization, to whom persons not belonging to that Commission may be added by ministerial order. The Committee on Finance shall be composed of members of the Commission of Organization and of members of the guarantee association.

ART. 5. The Commissioner General, appointed by the decree of October 24, 1880, shall have charge under the authority of the Minister of Posts and Telegraphs, of the execution of the decisions adopted by the Council of Administration. The Commissioner General shall have the direction of the clerical force employed.

ART. 6. The Commissioner General, or, in his absence, his secretary, shall have the right to be present at the meetings of the Council of Administration.

Art. 7. Foreign countries which shall have signified their intention to be represented at the International Exhibition of Electricity shall be requested to designate Special Commissioners. These latter shall

correspond directly with the French Commissioner General.

II.

ADMISSION—CLASSIFICATION.

#### ADMISSION—CLASSIFICATION

ART. 8. Requests from foreigners or French citizens for the admission of articles should be worded as far as possible according to the blank form appended to these regulations, and should be in the hands of the Commissioner General at Paris not later than the 31st day of March, 1881.\*

Art. 10. The Commissioner General shall notify exhibitors previously to May 15, 1881, of the admission of their goods, and also of the extent and situation of the space allotted to each one of them.

ART. 11. Foreign commissioners shall have the privilege of asking for and of receiving, in a lump sum, the space necessary for the articles to be exhibited by the citizens of their respective countries. The cumulative applications of foreign Commissioners must be in the hands of the Commissioner General before March 31, 1881. The general plans for the allotment of the space granted in pursuance of this article shall be submitted to the Executive Committee of the Exposition.

ART. 12. Exhibitors residing in countries which shall have designated no special commissioners may correspond directly with the French Commissioner General.

The Ministry of Posts and Telegraphs, No. 101 rue de Grenelle Saint Germain; the office of the Commissioner General, in the Palace of the Champs-Élysées, room No. 4; in the rooms of the Chamber of Commerce and of the Scientific Societies of Paris and of the Departments.

ART. 14. The principal articles which will be received for exhibition are the following:  
Apparatus for the generation and transmission of electricity; natural and artificial magnets; compressed apparatus for the study of electricity; applications of electricity to telegraphy and the transmission of sound; to the generation of heat; to illumination and the generation of light; to the light-house and

signal service; to signal apparatus; to mining, railways, and navigation; to military affairs; to the fine arts; to gynecology, electro-chemistry, and the chemical sciences; to the generation and transmission of motive power; to the mechanic arts and clock making; to medicine and surgery; to astronomy, meteorology, and geology; to agriculture; to registering apparatus; to the working of the various kinds of

ART. 15. Articles admitted for exhibition shall be received in the inclosure of the Palace of the

Boxes containing such articles should bear the addresses and the special labels furnished by the Commissioner General.

III.

ART. 16. Exhibitors shall not be obliged to pay any rent for the occupation of the space allotted them.

Exhibitors shall have their goods put in place and the space allotted to them decorated at their own expense.

Note.—In the case of applications made by citizens of the United States through the United States Consulate, the time has been extended to May 15, 1906.

The plans for the arrangement of the goods and the designs for the decorations shall be submitted to the approval of the Commissioner General.

Art. 18. Motive power shall be furnished, at a price hereafter to be agreed upon, to such exhibitors as may desire it.

Motive power may be furnished gratuitously for the experiments necessary for the labors of the International Congress of Electricians organized by the State at the time of the exhibition.

## IV.

## ADMISSION OF SPECTATORS.

Art. 19. The Exhibition shall be open to the public daily from 8.30 A. M. to 6 P. M., and from 8 to 11 P. M.

Art. 20. Free tickets of admission, which shall be good for the entire exhibition and shall not be transferrable, shall be furnished to members of the Commission of Organization, of the Technical Committee, to members of the Commission of Finance, to members of the guarantee associations, to foreign commissioners, to members of the International Congress of Electricians, to the officers employed by the Commissioner General, to exhibitors and to those of their employes whose presence shall be deemed indispensable.

Art. 21. The collection of the price of admission as fixed in Article 22 shall take place by means of tickets of admission of the value of fifty centimes each.

Art. 22. The ordinary prices of admission shall be as follows:

1st. On week days—	1 fr. 50c.
From 8½ to 11 A. M.—	1 00
From 11 A. M. to 6 P. M.—	1 50
From 8 to 11 P. M.—	1 00
2d. On Sundays—	0 fr. 50c.
From 8 A. M. to 6 P. M.—	1 00
From 6 to 11 P. M.—	1 00

## V.

## POLICE SURVEILLANCE—ORDER AND CLEANLINESS.

Art. 23. A strict surveillance for the prevention of theft shall be organized by the officers in the employ of the Commissioner General, aided by the police. The most thorough precautions shall be taken against fire. Nevertheless, the management shall not be responsible for losses occasioned by theft or fire.

Art. 24. Articles placed on exhibition shall not be removed before the Exhibition is closed, except by special permission from the Commissioner General.

No drawing shall be made, nor shall any photograph be taken, of any article placed on exhibition, without the express permission of the exhibitor, voted by the Commissioner General.

Art. 25. Exhibitors shall themselves defray the expense of keeping in proper order and of cleaning the articles exhibited by them.

Art. 26. A special place shall be furnished to such exhibitors as may desire it for the storage of their boxes or cases during the whole time of the exhibition. Exhibitors shall be obliged to pay a charge of 6 francs per cubic metre. Any case whose dimensions are less than one cubic metre shall pay the price fixed for one metre. The expense of returning empty cases, and of putting them in proper order, shall be defrayed by the exhibitors.

Art. 27. Both French and foreign exhibitors shall enjoy the guarantees furnished by the law of May 23, 1868, to parties making invention entitled to a patent, of models and industrial designs that may be submitted to the board of experts (Conseil des brevets). It shall be sufficient for them to deposit at the office of the Prefect of the Seine, during the first month after the opening of the Exhibition at the latest, an application for a certificate of guaranty for the articles exhibited. Such certificate, which shall be furnished gratuitously, shall be good from the day of admission until the end of the third month after the closing of the Exhibition.

## VI.

## CATALOGUE—PROMISS.

Art. 28. A general catalogue of the Exhibition shall be prepared under the direction of the Commissioner General. The contract for doing this work shall be awarded to the most satisfactory bidder. The party to whom the contract for the preparation of the general catalogue shall be awarded may communicate directly with exhibitors whose names are officially registered, for the insertion of advertisements, notices, and data relative to the articles sold or manufactured by them.

Art. 29. Diplomas of merit and medals of various classes shall be awarded in pursuance of the recommendation of a jury for whose composition provision shall be made hereafter.

Art. 30. All communications in relation to the International Exhibition must be addressed, post-paid, to the Commissioner General of the International Exhibition of Electricity, room No. 4, Palais des Champs-Élysées, Paris, (Au Commissaire Général de l'Exposition Internationale d'Électricité, au Palais des Champs-Élysées, salle No. IV, à Paris).

The foregoing regulations having been adopted by the commission of organization are hereby approved, on this 6th day of December, 1880.

By the Minister:

GEORGES BENOIST,

Commissioner General.

AD. COCHERY,

Minister of Posts and Telegraphs.

## [APPENDIX II.—Translation.]

Law of the 23d of May, 1868, relating to the protection of inventions capable of being patented, and of designs for objects admitted to public exhibition authorized by the administration throughout the Empire.

ARTICLE 2. Every Promiss or disclosure, being the author either of a discovery or an invention, which, according to the terms of the law of the 23d of May, 1868, is capable of being patented, or of patterns for designs, (which must be registered in conformity with the law of the 23d of March, 1864, or by the representative, can (if they are admitted to a public exhibition authorized by the law) claimant) requires the deposit of a model of the invention or arrangement in which it is embodied, and is exposed to deliver to the public a certificate of deposit.

ART. 3. This certificate will have in the person who claims it the same rights as would be conferred on him by a patent or by a legal recognition of a patent for discovery or invention. From the day of admission to the end of the third month following the close of the Exhibition, without prejudice to the patent which the exhibitor may take out, or to the registration in any office, before the expiration of this period.

ART. 4. The application for this certificate must be made at the latest within the first month from the opening of the Exhibition. It must be addressed to the Ministry or sub-department to which it belongs in the present, and, if necessary, by a plan or drawing of the object itself. All applications, as well as the decisions arrived at by the prefect or by the sub-prefect, will be entered in a special register, which will be sent to the Ministry of Agriculture, Commerce, and Public Works, and will be communicated, without expense, to any applicant. The certificate will be granted gratuitously.

The Evening Post Sept 9. 1887.

[illegible]

The Metropolitan, Aug. 13. 1887.

The Paris Exhibition of Electricity was formally inaugurated on Wednesday morning by the visit of M. Jules Grévy, and on the following day it was opened to the general public. The exhibition, as we saw, appears, however, to be very far indeed from being in time, and it is stated that for some time to come the whirling of machinery. We are told, distinctly heard, as the hammer and the pickaxe will be as the English section, for example, not a single steam engine has arrived, and that for a few days, at least, it will be impossible for an electric light to be shown there. In this respect, however, England would seem to be no more backward than other nations.

[illegible]

The world-famed inventor of Moles Periscope, who for the past few years has been starling the world with his new and improved periscope, has fitted two rooms with exquisitely constructed and most complete sets of electric and lighting purposes, bearing a host of low important apparatus for the application of electricity in the most perfect manner, and in which it has not hitherto been used. From both rooms are suspended a number of beautiful incandescent lamps, similar burners being attached to the walls on brackets easily moved into any position, and the electric apparatus is so arranged as to be readily manageable as any gas apparatus. The Edison lamp may be simply described as a small globe of glass, containing a small carbon filament which is fixed on an exceedingly delicate arch of platinum, and which is so arranged as to become incandescent by the transmission of the electric spark, emits an agreeable soft light, and is so constructed as to be easily and accurately distinguished. These lamps, enveloped in a larger globe filled with gas, are suspended in a large hall, and are used for the purpose of averting accidents from explosions. To mention all the details of the work for the purpose of advertising the same, would be to exceed the limits of the column. Suffice it to add that in addition to the above mentioned apparatus, there are also a number of other telephonic appliances in the frame, and the whole is so arranged that the human voice in song from Philadelphia to London can be heard not repeating or articulating any word.

English Mechanic & World of  
Science, Aug. 19, 1887.

[illegible]

United States Commission,  
COMMISSIONER GENERAL'S OFFICE,  
Department of State,  
WASHINGTON, D. C.

MINISTÈRE DES POSTES ET DES TÉLÉGRAPHES.

Exposition Internationale d'Électricité, Paris, 1881.

## DEMANDE D'ADMISSION

Je soussigné <sup>1</sup> .....  
 demeurant à <sup>2</sup> .....  
 demande à être admis à exposer les objets ci-après énumérés :

Déclarant avoir pris connaissance du Règlement général et y adhérer, je désire obtenir les espaces désignés ci-dessous, aux conditions fixées par les articles 16, 17, et 18 dudit Règlement général.

Surface horizontale sur sol: { Longueur: .....  
 { Largeur: .....  
 Surface verticale sur pareis: { Largeur en façade: .....  
 { Hauteur: .....

Forces motrices: ..... chevaux-vapeur, chaque jour pendant ..... heures

Lo ..... 1881

(Signature: ).....

<sup>1</sup> Laisser cette indication en blanc

\* — 2 Écrire en allemand et en caractères les noms, prénoms, raison sociale et adresse.

NOTE.—La présente demande doit être expédiée à l'adresse de Monsieur le Commissaire général de l'Exposition internationale d'Électricité, au Palais des Champs-Élysées, Porte n° IV, à Paris; et remise, sous pli, à M. THE ASSISTANT SECRETARY OF STATE, WASHINGTON, D. C.  
*Le franchissement est nécessaire.*



[illegible]

Industrial News, August, 1887.

## ELECTRICAL CONGRESS.

A volume containing copies of specifications and drawings of all the patents issued by the United States on electrical devices has been prepared, under direction of the Commissioner of Patents, and forwarded to the International Electrical Congress, which convenes in Paris August 1st. Dr. Freeman, Examiner of the Class of "Electricity," has been selected to represent the Patent Office at the Congress, and is about to fulfill his duties on the 20th of July. The selection of Dr. Freeman is a fortunate one, since his ability and experience in Patent Office matters qualify him to credibly represent this country.

THE PARIS ELECTRIC  
EXHIBITION.

[illegible]

Science, Sept. 14<sup>th</sup> 1887.

We understand the Edison Light Company has been notified that the French Government, after inspecting all the electric lights in the Paris Electrical Exposition, has selected the Edison Company to light the Grand Opera-house of Paris with the Edison electric light. The Edison Company will ship the necessary electrical machinery to France by the next French steamer, and will light up 500 Edison electric lamps in the opera-house on Oct. 7.

United States Commission to the  
Paris Exhibition of Electricity, 1881.  
Department of State, Washington, May 17, 1881.

Sir,  
I enclose herewith the substance of recent circulars and communications received from the French Commission General of the Paris Electrical Exhibition of 1881, for the information of exhibitors. Your attention is urgently called to these statements, and your compliance therewith, in all particulars having reference to your application, is solicited, with all promptness.

15. Plans for Installation. All exhibitors are requested to send, at once, to the undersigned, plans of their exhibits, with measurements. Each plan should show how it is proposed to place the machine, apparatus, show-cases, etc., in the space applied for, should give dimensions and height of each, and should especially designate all powerful machinery.

2nd. Labels. Exhibitors are requested to notify the undersigned, at once, of the number of packages in which their exhibits are to be shipped, in order to receive the indispensable official labels.

5th. Invoiceing. When articles are shipped, exhibitors should prepare a statement, or invoice, in duplicate showing the number, weights and contents of the packages. One copy of this statement is to be mailed, directly, to "Mr. George Walker, Honorary Executive Commissioner of the United States, B. 3, rue Riche, Paris, France." The other should be sent to the undersigned.

All applications are distinguished by two numbers, the American exhibit number, and the General Exhibition number. Your application is numbered \_\_\_\_\_ on the American series, \_\_\_\_\_ and \_\_\_\_\_

and you will so designate it in the statements and on the labels.

4th. French Transportation. The French railways will charge regular tariff rates on goods for exhibition carried to Paris, but will take them back to the port of re-shipment gratis, thus practically offering a reduction of 50 per cent in favor of exhibitors. This reduction does not extend to registration fees, receipt stamps, etc., nor to cartage between the railway terminus in Paris and the Place of the Champs Elysees, or vice versa. The French railway companies will not be responsible for articles conveyed at reduced rates. No reduction will be allowed in the case of exceptionally heavy packages. The official label (see above, § 2nd) will be evidence of the right of the goods to these facilities of transportation.

5th. Customs formalities. The Place of the Champs Elysees, where the Exhibition is held, is made a bonded warehouse of the French government. All packages duly labeled will be passed at the frontier or port of entry without examination, sealed without charge, and sent directly to the Exhibition building. Articles will be inspected and catalogued by the Customs officers when unpacked. At the close of the Exhibition, all packages intended for re-shipment will undergo proper customs examination and certification in the Exhibition building, before removal. No dutiable articles shall be removed from the building before the close of the Exhibition, unless duties have been paid thereon.

6th. Time for receiving goods. Ordinary exhibits will be received on and after July 1st, and it is desired that all shall be delivered before July 15th. Heavy machinery, or articles of bulk involving delay in setting up, may be received at any time after May 1st, and it is desired that they be sent as soon as possible, in order to be set up in ample season for the opening day, August 1st, 1881.

7th. Catalogue. Each exhibitor will, at once, mail

to Mr. George Walker, the Executive Commissioner, at the address given above, the data necessary for the preparation of the official Catalogue of the American section. Each exhibit, or will be entitled to one line in the general Catalogue for his name, one line for his address, and four lines for a concise designation of the articles exhibited by him. If the same exhibitor display articles in two or more separate classes, he shall have a separate entry in the Catalogue for each. Advertisements and displayed announcements in the Catalogue will be permitted on special arrangements with the contractor for printing the same.

8th. Motive Power, its supply and cost. Special application must be made to the French Commissioner General, through the U. S. Executive Commissioner, Mr. George Walker, addressed as above, for horse-power, or steam supply for motors, stating the number of horse-power required daily, and the number of hours, whether afternoon or evening or both, during which it is desired.

A distinction is drawn between those making continued use of motive power, or steam supply, and those using either or both at intervals only, as follows:

A. Continuous engagements for motive power must cover at least 100 consecutive days. The price will be one franc per horse-power per hour. Ten per cent. discount will be allowed when the total amount of the contract exceeds 1000 francs, twenty per cent. when it exceeds 5000 francs, and forty per cent. when it exceeds 10,000 francs.

B. Continuous engagements for steam supply, when the exhibitors have their own motors set up, must be for at least 100 consecutive days. The price will be 75 centimes per horse-power per hour. The same discounts will be allowed as above, on contracts in excess of 1000, 5000 and 10,000 francs.

C. When motive power or steam supply is required at intervals only, the price will be, for either, one franc per horse-power per hour, without discount.

Working days and hours will be fixed by agreement between the contractor and the exhibitors.

The

The contractor will furnish the main horizontal shafting, and run the same. Exhibitors will furnish, at their own expense and risk, their own connecting shafting and belting.

When steam supply only is contracted for, the exhibitors must furnish all necessary shafting and belting, and run their machines without mechanical help from the contractor beyond the steam supply.

The charges for power, and for steam supply, are regarded as reasonable by the French Commissioner General, M. Berger, and he advises all parties to resort thereto to the contractor, M. H. Fontaine, 172 18, rue Dronot, Paris, through the French General Commission. If, however, exhibitors furnish their own boilers, as well as their own motors, certain facilities will be accorded to them, such as the remission of the municipal consumption tax on coal (which, it should be remembered, is generally bituminous in Europe), or, in the case of gas motors, a reduction in the cost of the gas amounting to 38 per cent, etc.

Steam or other motors, for exhibition, are not desired, unless they are expressly designed for running dynamo-electric or magneto-electric machines.

9th. Electrical Currents. These cannot be supplied by contract. Exhibitors needing such currents, must supply their own batteries, or dynamo or magneto-electric generators. If they have none of their own, they will have to hire them.

I am,

your obedient servant,

W. H. Brown

Acting U.S. Commissioner General.

THE PARIS ELECTRICAL EXHIBITION.

(Continued from first page.)

Two, five, ten, and twenty light machines are used in the Exhibitions to light the grandstands and other halls on the first floor. The machines are exhibited by Messrs. Sautter, Lemaitre & Co., owners of the new Gramme patents in France; they are by the Spanish, Electrical Society and by the Gramme Company. The Gramme Company make four sizes of machines. No. 1, for 1 to 5 lamps; No. 2, for 2 to 8 lamps; No. 3, for 6 to 8 lamps; No. 4, for 12 to 16 lamps. No. 1 and 2 have not been experimented with as yet, but it is thought they will exceed Nos. 3 and 4.

The Weston dynamo machine exhibited differs only slightly from those already described in our estimate. It will be observed by reference to the engraving that the field magnet is compound, being composed of a number of electro-magnets with cylindrical cores.

The Siemens steam dynamo used in connection with the electric railway is well represented by our engraving. The generator and steam motor are mounted on a common base, the motor being a rotary steam engine.

The car shown in Fig. 5 does not differ materially in appearance from an ordinary street car. The electric motor placed under the car floor is centrally located. It receives its current from the rails, and the power is transferred to the car axle by means of pulleys and belts.

Other important exhibits in the various departments will be described in later issues. About one-third of the 1,800 exhibitors are from countries other than France. A list of the American exhibitors appears below. Many of them are represented in two or more classes. The Edison exhibits are naturally attracting much interest. They appear in each of the six general groups of exhibits, and represent fifteen different classes. They are shown in two places, which consist of a complete illustration of the Edison system of incandescent lighting, as well as representations of all his inventions and discoveries.

It is remarkable that the labors of a single investigator and inventor should cover a field as broad almost as the entire scope of an international exhibition.

On the 25th of August an electric fire broke out in the reading room of the Exhibition. It was occasioned by a defect in the fitting up of some incandescent lamps. The alarm was quickly given, and the fire was extinguished before it had spread far. In attempting to tear out the wires with his hands a fireman received electric shocks and was twice knocked down. A scientific commission, headed by M. Dumoulin and Regnier, after word made on examination of the connections of the various exhibitors, and there is now no further danger to be feared.

PARIS ELECTRICAL EXHIBITION OF 1881—LIST OF AMERICAN EXHIBITORS.

- Thos. A. Edison, Menlo Park, New Jersey.  
J. Morgan Edisong, Philadelphia, Pa.  
Electric Dynamo Company, Philadelphia.  
August Pratt, Philadelphia.  
Theodore Schenker, Albany City, Pa.  
U. S. Signal Office, Washington, D. C.  
Joseph M. Hirsch, Chicago, Ill.  
Mills & Knapp, Chicago, Ill.  
Standard Electric Light Co., New York.  
U. S. Electric Light Co., New York.  
Weston Electric Light Co., New York.  
Wm. H. White House, N. Y.  
Wm. P. Dutton, Philadelphia.  
Alec. H. Ego, Mechanicsburg, Pa.  
Hosmer, Tinsell, Train & Co., North Adams.  
William J. Phillips, Philadelphia, Pa.  
J. F. Bailey.  
Alex. Graham Bell, Washington, D. C.  
Brunner, Tainter, Washington, D. C.  
Charles Williams, Jr., Boston, Mass.  
Coudry Bros. & McFright, Washington.  
George Cunningham, New York.  
Biographic Manufacturing Co., New York.  
Edison Gray, Highland Park, Ill.  
Post Indicator Co., New York.  
Chas. W. Hubbard, Boston, Mass.  
A. E. Dillner, Somerville, Mass.  
C. W. Sewell, Jr., New York.  
Clifton M. Bell, Troy, N. Y.  
Francis W. Croft, New York.  
W. G. A. Rowell, Philadelphia.  
Electric Purifier Co., New York.  
Robert Howe, Indianapolis, Ind.  
Volney W. Mason, Providence, R. I.  
U. S. Patent Office, Washington.  
Edou. Millaud, New York.  
Batholomew Institution, Washington.

*Nature*, August 17, 1881.

At the Exhibition of Electricity the completion of the English telegraphic department is progressing favorably. The series of solid rod compact conductors used in the British service will contrast, as without advantage, with the quadruplex twisted and other apparatus presented by the French administration. The Italian telegraph section is full of relics of instruments used by Galvani, Volta, &c. A large number of autographs will be exhibited, among which may be met a letter from Volta to Sir Joseph Banks, then president of the Royal Society. This document is stated to be the first description of the Voltaic battery ever written by its inventor. A small sword, which Galileo armed with his own hand, is exhibited, as well as a letter signed by the mathematician "old Cimento" for their determination of the laws of the variation of a magnetic power according to distance. The Academy of Arcadian of Paris exhibits a model of the electro-magnet, an electrical bell connected according to the principles advocated by Laplace de Lamo, and a number of other electrical instruments. Mr. John Galt, a well-known astronomer, has sent an electrical warning when the lightning is descending on a distant village is not to open; when it is ascending under shelter. This effect is obtained very simply by a valve, which is in equilibrium when the lightning keeps its fire, and is moved by a slight wind. The formal opening was to take place presided by a son of the President of the Republic, and the doors will be thrown open to the public to-day, although much remains to be done for the completion of the display, which will be a great success.

The French Government has appointed a Committee, presided over by Messrs. Adolphe Bruguier, to study the different applications of electricity to navigation.

PARIS, International Exhibition of Electricity. PARIS.

OFFICIAL CATALOGUE OF THE EXHIBITION

A. LAHURE, EDITOR

PARIS, 9, Rue de Fleuries, 9, PARIS

May 14, 1881.

Sir,

I have the honour to inform you that the *General Printing Office* of A. Lahure has obtained the right of printing the official catalogue of the International Exhibition of Electricity.

Electricity is occupying public attention; though it is a mysterious power, science will soon have unravelled its inmost secrets. Every body is preparing to follow with the greatest interest the important experiments which are going to be made in the Palais de l'Industrie.

Compiled with the greatest care from the documents furnished by the Administration or by the exhibitors themselves, the *Official catalogue* will be a sort of exact, complete, historical and technical encyclopedia of every thing concerning Electricity. It will be an indispensable *faux-naum* for scientific and commercial men whom this subject interests and will be equally sought after by the general public. Its moderate price

1. By special appointment of the General Commissioner of the Exhibition the *Official catalogue* is the only one which will be published or sold in France.

(one franc) will place it within the reach of the smallest means. We are convinced by the above reasons that the circulation of the *Official catalogue* will attain a very high figure, and will constitute a source of publicity of unusual importance.

The rules of the Exhibition allow you as exhibitor to insert gratis in the body of the official catalogue, and in each class in which you exhibit, beside your name and address, *eight lines* of about twenty five letters each, containing particulars of your industry. We should be obliged to you if you would forward to us as soon as possible the text of this insertion.

To make up for the smallness of the space which is accorded gratis, exhibitors are hereby authorized to insert at their own expense in the official catalogue supplementary information concerning their business.

These insertions are of three kinds :

- 1<sup>a</sup> A more or less abridged mention interpolated in the list of exhibitors which will be printed in two columns. — The line of 25 letters. . . . . Price, 6 fr.
  - 2<sup>a</sup> A special mention more or less detailed interpolated in the descriptive and technical summary relative to each class. — The line of fifty letters. . . . . Price, 12 fr.
  - 3<sup>a</sup> Advertisements in the strict sense of the word, with or without « clichés » printed on a special page at the end of the catalogue. — The page with or without engravings printed in black. . . . . Price, 400 fr.
- The page with or without engravings printed in two colors. P. 600 fr.

We will undertake, if useful, the composition of the notices of advertisements which, in any case, will be submitted to the approval of the General Commissioner.

We remain Sir,

Your obedient servant.

A. LAURE.

N. B. — The official catalogue will have the form of the present circular and the list of exhibitors will be as follows.

- |   |  |
|---|--|
| <p>1. Renard (Voy), rue Bonaparte, 62.<br/>— Fab. de jouets en bois et articles à mouvement, marionnettes, pantins, folies et autres ; jeux de polichinelle, lobbés et pantins habillés, articles nouveaux, mécanismes de porteurs d'eau, voitures de toutes grandeurs en bois naturel et peint. Commission et exportation.</p> | <p>2. Renaud, rue Cassinière, 8, à Paris.<br/>Prochainement, 1. — Spéc. d'outils de jardinage, forges, poils en son poil, poils en soie et poils anglais, carcasses-limbres, voitures d'enfants et de poupées, tombereaux, tonneaux, quillots, tasses hollandaises, articles de ménage, jouets en bois et en fer forgé, jeux de toutes sortes.</p> |
|---|--|

The last and the « clichés » must be forwarded before the 5th of next June at the latest to M<sup>r</sup> A. LAURE, editor, 9, rue de Fleuret, à Paris.

The amount of the insertion to be paid before hand by a cheque on Paris, payable at the order of M. LAURE.

Reproduction or reduction and « clichés » of the engravings can be obtained by photography. It will be sufficient to send us a copy of the engraving.

Price for a « cliché » of a page (form of the present circular) 25 francs.

1881

Exposition internationale d'Electricité  
PARIS

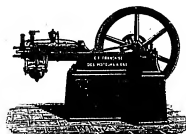
# Catalogue Officiel

A. LAHURE

IMPRIMERIE G. LAHURE

CONCESSIONNAIRE

9, rue de Fourcy, 9



SPÉCIMEN

*d'une page d'annonce en deux couleurs*

Radcliffe Baldwin  
United States Despatch Agent,  
53 Broadway, New York City







Iron, Nov. 11, 1887.

# ELECTRICITY, TELEGRAPHY

**PRIZES TO AMERICANS AT THE ELECTRICAL EXHIBITION**.—As a mark of the highest distinction, diplomas of honor have been awarded to the United States Signal Patent Office, and Messrs. Edison, Graham and Bell, as the inventors of the incandescent lamp; gold medals were awarded to the Anglo-American and British Electric Light Company, the United States Electric Light-Plant Company, the American Electric Works Company, the Edison and Puskas, Condit Brothers; silver medals to the DeLohme, Eccard, Electric Condenser Company, Hubbard Paul Dudley and Western Electric Manufacturing Company; bronze medals to the Western Electric Manufacturing Company; diploma of merit to Messrs. Edison, electro-mechanical works, the Hoosier Tunnel Company, the International Telephone and Telegraph Company, Photo-Relieve Company, Whitehouse, Smith and Williams.

Engineering & Mining Journal, July, 16<sup>th</sup>, 1887.

**The Electric Exhibition at the New York World Fair**—The Electric Exhibition at the New York World Fair, which is being sponsored by the Edison Electric Institute, has just been announced, and owing to the unusual wealth of material, it is expected that it will be the most successful of the series. It is to be held in the main hall of the fair, and will be open to the public from September 1 to November 1, 1900. The exhibition is to be held in the main hall of the fair, and will be open to the public from September 1 to November 1, 1900. The exhibition is to be held in the main hall of the fair, and will be open to the public from September 1 to November 1, 1900.

A WEEKLY RECORD OF SCIENTIFIC  
PROGRESS.

JOHN MICHELS, Editor.

PER YEAR,  
6 MONTHS  
3 "  
SINGLE COPY

FOUR DOLLARS.  
TWO " "  
ONE " "

PUBLISHED AT  
Tribune Building, New York.

SATURDAY, AUGUST 20, 1951.

The International Electrical Exhibition at Paris was opened with much *clat* on the 10th instant by the President of the French Republic.

The brief telegraphic dispatches describing the event, all state that Edison's exhibit was the chief centre of attraction, and that great interest was shown for the forthcoming exhibition of certain novelties which he had sent. These appeared to prove that the energies of the great electrician were far from exhausted on this subject, and that his fertile brain is as active as ever.

We are promised a very detailed report of this exhibition, so defer particulars until it arrives. England and Germany occupy the largest space of the foreign countries represented, America and Belgium coming next in order. All the departments on the day of opening were incomplete, the Americans complaining much of the dilatory behavior of the French workmen, who seemed to have no idea of the value of

We presume that the object of exhibitions of this character is to stimulate those engaged in electrical investigations, and to form landmarks in the history of electrical progress. In that light the Exhibition has many advantages, but Edison appears to have suffered from his generous permission to permit all comers to inspect the progress of his inventions. Many misinterpreted what they saw, and came to false conclusions, while men of no mental endowment who were mere clever mechanics, assiduously appropriated the ideas of the man of brains, and have since produced unnumbered copies. These men have so far proceeded unchecked, but the time appears to have arrived when Edison has decided to enforce with vigor all those patent rights which he has secured.

The seizure of the "*Maxim*" electric lamps at the Paris International Exhibition appears to have been directed in consequence of such a decision, and we can assure Mr. Edison that the public will heartily sympathize with him in his attempt to enforce his just rights.

Scientific Am. November 6, 1887.

In advance of the official publication of the awards of the International Exhibition of Electricity, the Paris correspondent of the *Herald* writes, October 20, the names of the successful exhibitors from this country.

As a mark of the highest distinction, diplomas of honor have been awarded to the United States Signal Office, the Smithsonian Institution, the United States Patent Office, and Messrs. Edison and Graham Bell.

Gold medals were awarded to the Anglo-American and  
Brush Electric Light Companies, the United States Electric  
Lighting Company, Elisha Gray, and Telator.  
Silver medals to Bailey & Paskus, Connolly Brothers &

Hubbard, Dowber, Eccard, Electric Purifier Company, Standard Pond Indicator Company, Western Electric Manufacturing Company, Weston Electric Light Company, and the Electro-Dynamic Company.

Bronze medals to Messrs. Olaver, Cunningham, and Diaz, of Hucosa Tunnel Company, Trinitro-Glycerine Works, and Photo-Relievo Company, White House, Mills and Williams.

If the relatively small number of American exhibitors be considered it will be seen that they have carried off a very large number of prizes. The awards have been made for an ensemble of each exhibitor's contribution, not for any one particular invention exhibited, except, of course, where there was only one.

Nature, August 19<sup>th</sup> 1881.

[illegible]

# THE PARIS ELECTRICAL EXHIBITION.

(FROM OUR SPECIAL CORRESPONDENT.)

To the Editor of "The Science."

THE late leaves Paris somewhat late, considering the official opening of the Electrical Exhibition took place last night, and, with the opening to the public followed the next day, viz., the 15th of August, but in fact the exhibition is not opened even yet, although the public is admitted during some hours of the day to look at the half-finished structures and to inspect the discovered instruments.

The daily newspapers and some so-called scientific papers, which give to their readers sensational articles rather than correct information, have been for about ten days crowded with descriptions of the meaning and the progress of the electrical exhibition, but the real good scientific papers have hitherto only given short notices, because it has, as yet, been impossible to study the value of the different instruments in the exhibition building, where everything is still in a half-finished state and where the noise of hammers and carpenter's instruments are still heard in every corner.

Notwithstanding this, I will endeavor to give you in this letter a description of the actual state of the exhibition, which will serve your readers as an introduction to the more special articles with which I will furnish your paper weekly.

When we first enter the Palais de l'Industrie through the principal pavilion, which is situated on the site of the Champs Elysées, we observe a series of beautiful statues which serve as "candelabra" for lamps of the Wertheimann system, and when we approach the entrance to the great nave our eyes are attracted with two enormous images representing a male and female lion, while we observe above our head a beautiful chandelier of iron wrought in twisted steel, furnished with Siemens lamps. This lustre will undoubtedly be very attractive if the arrangement for the light are made as carefully by the French firm of the well-known house of Siemens, as those in the German department, where some evenings ago the preliminary experiments made with the Siemens lamps attracted the general admiration of all those who had the privilege to witness them.

In the centre of the nave a light-house is erected, which is a copy of the light-houses that guard the coast of France. It is surrounded by a tall water-basin, which, although it may be called ornamental, is perfectly useful for the purpose for which it is destined, on account of its limited dimensions basin is intended as a field of exercise for the boat of M. Foucault, the *Voltaire*, which is driven by an electric motor, in connection with a Russian battery, and the length of which nearly equals the radius of the circumference of the basin.

I may here say a few words about M. Troust's boat, on account of which a good deal of nonsense has been published in European and American papers, one of the latter mentioning not less, as that M. Troust's boat, with which he experimented upon the Seine, consisted of a battery of M. Faure, but M. Troust is too well acquainted with the value of scientific instruments to appreciate the merits of the Faure battery and to substitute for it Faure's modification, as long as the former is better.

Count Du Moncel, whose name is well known among all descriptions, on account of his excellent work on the "Application of Electricity," which is the most complete work of its kind in existence, and also on account of his other numerous publications and inventions relating to this part of Science, pointed out the 7th of July last in a note to the Academy of Sciences, in which M. Troust describes in a very precise manner the motor used by

him in propelling a little boat. This note will give to your readers exact and correct information regarding the merits and properties of the motor used in the little canoe which is now seen in the Electrical Exhibition, and I therefore quote this note verbatim.

"A motor having a weight of 5 kilogrammes and in connection with six elements of a secondary battery of Plante, which produces a labor of 7 kilogrammes per second, was placed on the 15th of April upon a piece of ice, which later, rider and battery included, had a weight of 160 kilogrammes, and put in the vehicle a battery of 15 kilograms per hour."

"The same motor, and on the 24th of May, is a boat having a length of 5.50 meters and a breadth of 1.50 meters, in which three persons gave this boat a velocity of 2.50 meters in descending the Seine, at Passy-Mac-Morle, in moving against the current. The motor obtained its electro-motive power by means of two pistons, consisting each of 6 elements of bichromate of potash, and the propeller was furnished with a coil having 4 branches."

"On the 26th of June I renewed the experiment upon the quiet waters of the upper lake of the Ile de St. Heloge, using a coil with 4 branches having diameters of 0.80 meter and being in connection with 15 elements of Bunsen with flat plates such as are used in the Eichenhof battery. The liquid of these elements consisted of one part of hydrochloric acid, one part of nitric acid, and two parts of water in the porous vessel, in order to diminish the dissipation of hydrogenic vapors."

"The velocity of the little boat, which was measured with an ordinary log, rose in the commencement to 1.50 meters within 48 seconds, or a little more than 3 meters per second; but after three hours of working it had diminished to 1.50 meters during 55 seconds. After five hours of working the electricity was still 2.50 meters per second."

So much about M. Troust's boat, of which, a number seen in the upper story of the Exposition building.

At the left-hand side of the nave, nearest to the light-house, are the exhibition of Great Britain, Germany and the United States. The exhibition of Germany is that which has the most imposing appearance and is also that which was first completed. Two enormous "candelabra" in forged iron ornament the entrance of the department, and contain lamps of "Celsus-Bismarck" of Berlin. Near them stand two tripods crowned with the Prussian eagle, and behind them, upon a large number of tables, may be seen a collection of electrical instruments of all kinds, which we will describe in our reports hereafter. At the right-hand side of the department we see the busts of five German pioneers in the field of Electrical Science, viz., Otto von Guericke, Ohm, Siemens, Kirchhoff, and Gauss.

The historical collection of instruments in the German department is of the highest interest in its topography. I will only mention an exact copy of the first machine for static electricity, consisting of a rubber globe, which was electrified by means of a glass rod, and using the hand as a rubber; an electrical egg, so-called, of the Professor of Physics in Germany, and constructed at the commencement of the 18th century; an electro-mechanical apparatus for photographing, constructed by Thomas Siemens in Munich in the year 1809; decomposition of water. A magneto-electric telegraph was used in 1827 in order to keep up a telegraphic communication between the physical laboratory and the magnetic observatory in the University of Göttingen; the map of the first telephone ever constructed, and invented in the year 1851 by Reis, and a great many other apparatus of equal interest.

## SCIENCE.



EXTERIOR.



INTERIOR.  
ELECTRICAL EXHIBITION—PARIS, 1881.







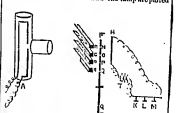




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English Mechanic & World  
of Science, Sept. 30, 1881.

[10263].—Among the great multitude of interesting objects, exhibited in the beautiful palace on the Champs Elysees, the following place of apparatus attracts the particular attention of the student of science, lecturer, and demonstrator:—The instrument is an outcome of Professor Hall's discovery in photophony, and may be called a photo-electric syren. It consists of an electric lamp, A, as source of light; an oblong disc, B, C, with four circular and concentric rows of holes (N O P T), between which and the luminous zone

[illegible]

2. TH  
3. TH  
mercury  
suro al

IF THE Congress is closed, the awards will be distributed, the Exhibition is now drawing to its end, although the exact closure is not known. The following

be taken down by the Congress:—

21. The coulomb-gramme second (C.G.S.) will be adopted for identical meaning as before.
22. The ohm and volt remain as before.
23. The edis will be represented by a new symbol.
24. Mercury lines square in section, at the top of the column, at 67° C. An international committee will determine its length.
25. A ampere is the current produced by a electro-motive force of one volt through a resistance of one ohm.
26. A coulomb is the quantity of electricity defined by the conditions that in the current of one ampere one coulomb per second pass the point.

**Ampere** is defined by the condition that the ampere is the current which, if maintained in two parallel conductors of infinite length, separated by one meter, would produce a force of two dynes per centimeter of length between the conductors.

The following resolutions have also been adopted by the Congress:-  
Establishment of an international conference for determining electrical units; for the standardization of terrestrial currents; for the study of the physical electricity of lightning-conductors; telegraph and telephone-wires a source of danger or protection against lightning; diameters of telegraph wires to be determined in accordance with the comparative strength of electric light to be made by incandescent lamps; an international commission to determine the unity of light; the Commission to determine the steps which each Government has taken in order to insure the inviolability of submarine cables.

[illegible]

also. Diploma of honour: Society of Telegraph Engineers and Electricians. Diploma of honour: Industrial establishment: Eastern Telegraph Company, Siemens Brothers and Company, Limited; Submarine Telegraph Company, Telegraph Construction and Maintenance Company, Limited. Diploma of honour awarded to inventors: Sir William Thomson, Honorary Diploma of Co-operation: King's College, Institution of Great Britain. Gold Medal: South Electric Light, Bright, British Electric Light Company, Elliott Brothers, Indian Telegraph Company; Latimer Clark, Fairhead, and Company, J. W. Swan.

### C. Details

WHEN water is decomposed in a voltaic cell, hydrogen is given off at the negative pole and oxygen at the positive pole. If you take away the battery with which we have

decomposing the water, and connect the poles of the voltaic motor with a galvanometer, we should observe a current flowing in the same direction of the current of our voltaic battery. Thus we obtain a short circuit current, during which the gases in the vessel recombine. On this principle Grove's battery consisting of fifty tubes, filled with hydrogen and oxygen and saturated with acidulated water. Each tube contains a plate of polished silver, and these plates, however, does not constitute a secondary battery, for Grove did not obtain his gas electrolysis.

In 1859, M. Gaston Planté brought a secondary battery, which merely consists of plates of lead dipped in acidulated water. The plates are rolled up together, with a layer of cloth between them, in order that they may not touch each other. This secondary or accumulative is charged by connecting it with a battery; the water is

the hydrogen going to the negative oxygen to the positive pole. After the battery is taken off and the accumulator is discharged, it gives an intense current of short duration. With a large number of accumulators, M. Piantó has made a generating series of experiments and recorded high tensid currents. It was soon found that accumulators impaired as they got old, this was seen to be due to a deposit of oxygen which formed on the plates. M. Fuairo, the accumulator, does not wait until a deposit has formed on the plates, but coats them with platinum, and thus deposits in a few minutes a layer which would take two or three years to be built. Fuairo's accumulators are made in Italy, by the S. M. S. Co.

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in five hours to saturation. In the case of the accumulators may be seen working on the accumulators, saws, pumps, &c. In the case of the light up part of Swin's last

Room.	Swan lamps.	Acce- lators
u. 4, Vestibule ..	23	1
" Kitchen ..	4	1
" Bathroom ..	2	1
" Telephone-room ..	17	1
" ..	18	1
Force of Luminaire Society	31	5
<b>Total</b> ..	<b>65</b>	<b>9</b>

was indubited for the above information. Dr. J. P. Lippmann, who kindly performed many of the experiments with the accumulation cell, is a copper-wire, 1/16 in. diameter, 100 ft. long, was brought to a bright in a very short time. Short pieces of copper immediately melted. It will be remembered that in the beginning Fuoro's accumulators were to be charged by batteries, but, as dynamo-machines are preferable, other cells may kind of battery.

### C. Details



# SCIENTIFIC AMERICAN

AN WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, STEVE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. 11, No. 12, 1881.

NEW YORK, SEPTEMBER 17, 1881.

THE ELECTRICAL EXHIBITION AT PARIS.

Two engravings on this page present to you the principal features of the Exposition Universelle at Paris for 1881.

The exhibition, which opened August 11, 1881, has attracted a vast number of visitors, and is the largest and most successful of the kind.

The exhibition is held in the Grand Palais, a magnificent building which was constructed with iron and steel.

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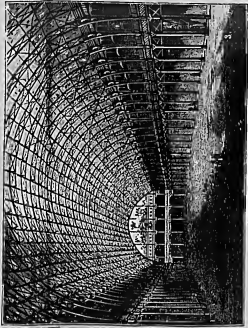
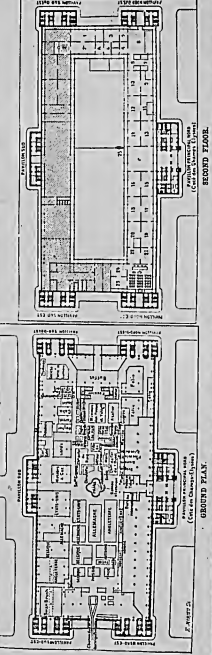
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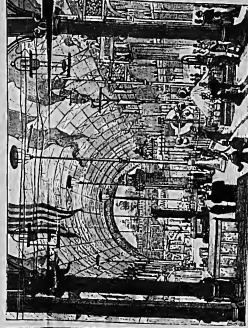
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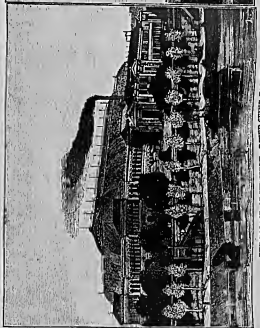
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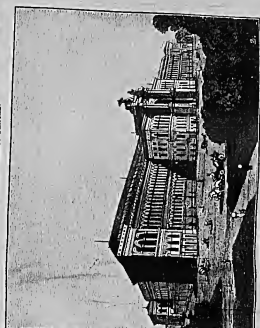
INTERIOR VIEW EXHIBITION.



INTERIOR WITH EXHIBITION PLACE.



THE PALACE OF INDUSTRY - THE EXHIBITION PLACE.



THE PALACE OF INDUSTRY - THE EXHIBITION PLACE.

THE INTERNATIONAL ELECTRICAL EXHIBITION OF 1881 AT PARIS - THE EXHIBITION BUILDING.

See page 20 also.



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6 de Setiembre 1981  
INDUSTRIA  
La Exposición de electricidad

París es la sola ciudad del mundo donde se siempre reunidos las exposiciones, porque el foco de las ciencias, de las letras y las artes está en el punto de cén de la moda y de los placeres.

Procede así demostrar que las exposiciones parisienses son distinguo de las demás por las circunstancias de comodidad y buen gusto que las acompañan. La que se abre hoy en el Palacio de la Industria es tanto más aperturante cuanto que estos últimos años las habido ver sufrir sobre de invenciones eléctricas, de sellos y sellos algunos, que permitirán llamar al siglo XX el siglo de la Electricidad, desde el siglo XIX, ha sido el

Los aparatos que están en menor número el Palacio de la Industria, porque sus aplicaciones son escasas todavía, reservados para los estudios clásicos, son los que se refieren a la electricidad estática.

Hace algunos años se han creado diferentes pilas máquinas que reemplazan a la pila de Volta, de Daniell, de Bunsen, de cristal, que no sé más que la electricidad por sí misma, y, aun la de estar bien acondicionada. Las máquinas nuevas, las de Holtz, por ejemplo dan las dos electricidades, positiva y negativa, en chispas considerables.

Creamos así el gran porvenir de la electricidad estática. Creamos que en ella se oculta la solución de los problemas tonamozto por guidos, y, por lo tanto, aplaudimos de veras porfijamente.

No nos explicamos bien, porque nuestra noción es que no hay dos especies de electricidad, dinámica y estática, sino una sola fuerza eléctrica, cuyas manifestaciones varían según los casos. No se produce electricidad estática con una pila y una botina de Ruhmkorff. Podemos seguir la corriente y emplear, para hacerse comprender, las denominaciones con-

Los aparatos de la electricidad dinámica dividen en dos categorías: el foco de la electricidad y la máquina de aplicación de la fuerza eléctrica.

El origen de la electricidad es antes u  
pila. Hoy es casi exclusivamente una m  
quina.

La pila eléctrica se conoce desde ha  
mucho tiempo. Se sabe es que su invencio  
dado á Volta, y que desde entonces á hoy he r  
corrido un largo camino. El fenómeno q  
produce es hacer pasar en un hilo de cob  
una corriente eléctrica, efecto de una reacc

10000

[illegible][illegible]

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du 14 Septembre 1884. An  
**LE CONSTRUCTEUR**  
**L'EXPOSITION D'ÉLECTRICITÉ**  
**AU PALAIS DE L'INDUSTRIE**

1<sup>er</sup> ARTICLE.

L'exposition d'électricité est la grande actualité du moment; et l'on peut en dire ce qu'on veut à buter à chaque instant contre des choses diverses et sans cesse en train de mûrir sur la tête. — Mais les personnes qui sont allées la visiter y sont certainement rendues trop tôt, car le grand intérêt d'une exposition, c'est la comparaison des divers systèmes qui servent à obtenir un même résultat industriel; et cet élément d'installation est en retard pour dire le moins.

Personnellement il en est plus méritants. Les visiteurs trop pressés ne le savent pas. — Ceci dit, du reste, sans l'insister le moins du monde que le fait d'être en retard implique une supériorité quelconque en faveur de ceux qui possèdent cette faiblesse habituelle. Mais, enfin, il peut arriver que l'on soit digne d'un grand succès comme constructeur ou inventeur, et même que, comme exposant, on mérite un même succès. — Valez donc par vos propres solutions trop tôt, si vous voulez les voir sérieusement.

La première chose doit donc se présenter par celui qui veut visiter une exposition avec fruit, c'est de procéder à son examen avec ordre et méthode. — C'est une grande erreur de croire que l'ordre est une chose arbitraire et qu'il suffit, pour procéder méthodiquement, de suivre une série de chiffres allant à droite, puis, de la parcourir en sens l'exact inverse et ainsi de suite. — Il faut l'ordre où il se manifeste naturellement, mais dans la succession qu'engendrent les phénomènes, sans ignorer des ordres d'analyse auxquels on apporte le respect.

Une exposition d'électricité n'est pas un tas de choses dans lequel se vendent des piles, des lampes, des bougies quelconques, des régulateurs ou d'autres objets quelconques, des régulateurs tels et pouvant l'être dans une certaine mesure.

Ce doit être l'aspect palpable de l'état actuel d'une branche importante de la physique, et dans l'étude d'un système, en y arrivant par le commencement logique, que l'on s'efforce de comprendre quelque chose. Que l'on ne se propose pas simplement d'être plus ou moins ébloui pendant un certain

nombre de jours. — L'ordre est d'autant plus nécessaire, du reste, dans le cas présent, que l'exposition renferme, en définitive, une foule de choses qui ne se retrouvent à l'étude de l'électricité que de très loin ou avec une force due de bonne volonté. — Il y a là des détonations de métaux sous toutes les formes, en fil et en tubes roulés et platis. — On y aperçoit des courroies, des râbles de dentelles, des plumes métalliques, de l'outillage, des tarauds, des photographes, des voitures, des pompes. — Merveilleux affaire, donc, que de se présenter au milieu de cela, sans programme et sans but. Erreur encore de croire que parce que l'on a schématisé le catalogue (c'est-à-dire, officiellement, cent vingt sous) on sera très fier sur la meilleure conduite à tenir. Ce n'est pas de tout cela qu'il s'agit.

La première chose que doit faire, à notre avis, l'ingénieur (ou même le simple élève) qui veut visiter l'exposition d'électricité, c'est d'acquiescer, sur la science des électriciens, quelques connaissances générales et d'être assez fou de ces connaissances pour comprendre ce qu'il voit, et savoir les applications que les exposants ne demandent pas mieux que de lui donner.

Point d'ici besoin de faire de longues et pénibles études. — Il suffit de lire l'ouvrage intitulé : *Les principes applications de l'électricité*, par E. Hignettier, ingénieur des Arts et Manufactures (G. Masson, éditeur). Ce n'est pas bien long; c'est suffisamment clair et exposé. Il y a point à dire que les formules savantes ou soi-disant utiles et que les initiés soi-disant initiés du public ne peuvent s'exprimer un langage qu'on peine à suivre. En un mot, l'écrit est pratique. C'est la vulgarisation d'électriciens sous peine d'être de la science sans limite du possible. Des-faveur de la terre (ce qui n'est pas un péché) ajoutant qu'il traite successivement des sources d'électricité (piles électrochimiques et thermo-électriques), machines électro-dynamiques et transformations électro-motrices, de l'électricité électrique (régulateurs, bougies électriques, éclairage par incandescence) et applications de l'électricité (télégraphes, téléphones et microphones (c'est-à-dire, téléphonie), télégraphes sans fil (radio-télégraphie), et de la télégraphie moderne et de la télégraphie sans fil). — Voilà la table des matières concisément résumées. — Les ordres nous dans les articles que nous consacrons à l'exposition d'électricité, nous le savons, nous pas à pas, sans nous préoccuper, autre mo-

de, de connaître quelques-uns des procédés de l'exposition française, telle autre, dans l'exposition anglaise, etc.

Qu'importe, en effet, ce détail au point de vue de l'étude générale de la science?

Qu'importe les médailles ou diplômes d'honneur qui pourront être décernés?

Avant d'entrer, toutefois, dans le vif du sujet, nous dirons, dans un prochain article, quelques mots des systèmes de chaudières et de machines auxiliaires à décharger la production de la force motrice qui anime ce complexe gigantesque. — Ce n'est pas qu'il se soit produit la même nouveauté extraordinaire depuis l'exposition universelle de 1878. — Mais, enfin, tel système qui débute en 1878 a gagné, depuis, un grand nombre de termin. — Tel autre, qui brilla d'un vif éclat, a continué à briller; — tel autre s'est perfectionné; et tel autre est resté stationnaire ou s'est décliné.

Nous rendons compte de cette situation avec une impartialité absolue, mais nous pourrions dire un peu moins complet que nous le voudrions parce que, dans la plupart des expositions, les données précises sur les chaudières et les machines sont très difficiles à obtenir. — Le service des renseignements ne se fait que peu ou point, et, loin de faire connaître leurs travaux aux visiteurs, il semble que les constructeurs viennent à tenir leurs études secrètes. Nous ne savons s'il en sera ainsi cette fois et si nous aurons faits l'expérience à cet égard, mais il serait dommage qu'il en fût autrement que les autres années, car rien ne ressemble davantage à une exposition que l'exposition précédente, bien que chaque fois des nouveautés laissent en suspens les parties de tout raffiner.

Les hommes changent et les errements restent.

L. POUILLON,

ingénieur des Arts et Manufactures.

**Les Progres de l'Indr**  
**Lundi 22 Août 1884**

**L'ÉLECTRICITÉ**  
**AU BLANO**

M. Gaston Sencler a reçu, de Paris, la dépêche suivante :

Paris, 20 août, 5 heures soir.

Gaston Sencler, Le Blanc.  
 Grâce à l'assistance de M. Sencler, le meilleur système d'alimentation électrique de Blano n'a pu être installé dans le département de l'Indre, avant tout autre endroit en Europe. Aussitôt l'arrivée à Paris du représentant de M. Edmon pour l'exposition électrique au Palais de l'Industrie, M. Sencler a été chargé d'étudier le système pour l'assurer, s'il était possible, de l'appliquer à des petites villes. Comme Le Blanc est Châteauneuf, on se voit qu'un syndicat puissant de finan-

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**L'exposition d'Electricité.**

Un jour, à terre et séparées du tube extérieur par une matière isolante; ces deux tuyaux forment les éléments du circuit principal on passe le courant dans le tube principal, le tube peut être placé dans le sol, à un pied ou de profondeur; il forme la grande arête de la canalisation lumineuse. Chaque bloc est relié à l'autre par un arête secondaire qui va l'atoléro et l'entoure complètement. Cet arête secondaire qui épouse la forme du bloc de maisons, a des branches terminées, si l'on me permet le mot, tesquelles sont dans chaque maison. Les arêtes secondaires sont moins larges que l'arête principale, les arêtes latérales moins larges que les arêtes

[illegible]

Le principe de ce  
pto; car il est blon c  
paraître dans les dou  
du paplor ronduo dor  
autent de lumière qu

Le photomètre est très simple à utiliser. Il suffit de placer la caméra devant l'objet à mesurer. La caméra est munie d'un objectif qui permet de faire passer la lumière à travers une lentille. La lumière qui passe à travers la lentille est captée par un détecteur qui mesure l'intensité de la lumière. Les données sont alors envoyées à un ordinateur qui les traite et les affiche sur un écran.

environ du quadrilatère qui  
est le prolongement de Wall-street,  
la station centrale destinée  
aux autos vu les plans com-  
mun : elle comporte 12 machi-  
nes à vapeur, 2 machines électro-motrices,  
aux machines à vapeur. On  
voit une force motrice de 1.000  
chevaux mais il ne faut pas croire que  
cela suffira pour tout le temps.  
Il paraît que l'on a en in-  
tention de faire trois variables  
de la force motrice on 12 : la  
première sera considérée en effet  
comme un réservoir de force, destiné  
à donner de la lumière, mais  
électrique, car tout ce qu'on

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La courte description que nous venons de donner de cet ingénieux appareil ressortit l'avantage économique qui résulte de son emploi, et qui réalise le perfectionnement le plus pratique, le plus sûr pour l'usage domestique de la lumière électrique.

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La lampe Tonnard restait donc, de la maistrise la plus honoree, mais des plus grandes questions qui aient jaugé au premier rang des soucis de l'architecte. Les autres jumeaux valaient donc la peine d'être jumeaux. Elle jeta à cette occasion une formidable facilité d'adaptation, la suppression du toit d'angle d'habitude, la commodité de nos installations, le bon d'usage des matériaux de la ville et de la petite station d'été à la campagne, dans les chalets, partout où un bon usage de la marque d'architecture de la ville a été capable de sembler une chose facile, l'élégance dans la lampe d'angle d'habitude.

On était nourri à un obstacle décevant en contraste d'ordinaire avec lui dans les matières industrielles, tout misérable qu'il mêmes minerais. Le platin se réduit soit aux yeux du savant : le prix de re-aisement ou fils aussi minces qu'on l'en vient.

[illegible]

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Un travail progressif, humainement loct, da-  
vaient présenter l'homogénéité parfaite,  
nécessaire au passage régulier du courant.  
Décidément les œuvres de la nature  
étaient encore bonnes à quelques choses :  
un Américain lui-même, et non pas certain  
le premier venu, étoit obligé de recon-  
naître que le mécanisme humain ne peut  
pas encore tout faire à sa place.

Blentôt les myrindes du bois et de plantes virent s'accumuler à Monto-Park. Trois plantes seulement triomphèrent de toutes les épreuves, et parmi elles on choisit le bambou comme la plus parfaite. Le bambou est une des variétés de bambous entre lesquelles on choisit le meilleur, et il ne fallait le faire qu'en connaissance de cause. Un agent habile, M. Moore, fut envoyé en Chine pour visiter les bambous, tous les bambous, les bambous odreotis ou les bambous, tous subit une modification; on eut même l'idée d'essayer les vieux morceaux de bambou provenant de constructions l'empêtra sur toutes les côtes. La variété qui l'emporta sur toutes les autres est une espèce de bambou du Japon, on le trouve d'ailleurs en quantité assez considérable de sorte qu'on n'a aucune crainte d'en manquer pour même que les temps nous ne venions remplacer partout les anciens.

Les qualités qui déterminent principalement le choix sont la régularité des fibres et surtout la facilité de la division. Les fils, en effet, ne devaient avoir qu'un cinquième de millimètre d'épaisseur ou, si l'en veut, de section transversale. Autrement ils se faisaient cârrés ; aujourd'hui les sont aplatis et plus minces encore, car leur épaisseur ne dépasse pas 7 millièmes de pouce et leur largeur 13 millièmes.

Ce travail de division se fait maintenant tout, soit à la mécanique avec une régularité parfaite, une promptitude merveilleuse et une économie remarquable, qu'elles qu'un bon industriel doit priser avant tout. Au lieu de la forme en spirale qu'évalent les fils de platine, on donne aujourd'hui aux fils de charbon la forme d'un demi-cercle un peu allongé parce que le charbon de bambou lui-même est interpréter pos aux mouvements copieux que subit le platine.

La forme extérieure de la lampe s'est aussi un peu modifiée à la suite de tous ces changements de son contenu. Elle

Enfin la partie la plus scabreuse de la fabrication des lampes; c'est la vidange par la pompe à mercure. On commençait par employer les pompes existantes, notamment celles des systèmes Springollet Gossier. Mais il fallait vider le mercure à

« Mais, trevons-nous d'écouter ceux qui nous ont précédés... »  
« Je m'empresse de peindre Edson et son compagnon collaborateur, notamment MM. Bachelot et Jézeq, qui le représentent au jourd'hui à Paris, et la pauvre Ségur qui allait mourir à la Havane d'un autre malade. Cela n'est pas étonnant, car pendant presque tout l'hiver il fellut traîner dans les rues de la capitale de 130 tonnes de feraille, dont 60 tonnes de ferrailles Falchonet, 6 tonnes de la vision 55 des régiments canadiens, au milieu d'une terrible atmosphère mœreuse, car il ne se pouvait pas mesurer de 800 livres de morture dans les fissures de tout genre que présentent les matériaux d'une maison.  
Aujourd'hui ces pompes sont simplifiées : une seule roue, mise après une certaine période de repos.

Le Park qui fonctionne automatiquement, sans émanation de mercure, sans manipulation dangereuse ou désagréable, sans que leur présence se révèle autrement que par un bruit particulier qui ferait croire à une chute permanente de grêle. La perception du vide est d'ailleurs une des principales qualités de l'appareil, car un 10 de charbon qui donnerait une tonalité de 10 bougies dans le vide de la machine pneumatique arrive à 16 bougies dans le vide de la pompe à mercure.

Neu avons tenu à raconter avec détail l'intéressante histoire de la lampe Edison parce qu'elle montre combien il faut d'efforts persévérants pour arriver aux résultats simples, c'est à-dire vraiment pratiques, et parce qu'elle met aussi en évidence le caractère tout particulier de l'union industrielle aux Etats-Unis : union du capital et de l'intelligence permettant de mener à bonne fin des recherches qui seraient impossibles chez nous.

Dans un prochain article nous examinerons comment la lampe Edison se complète par une distribution d'électricité à domicile et des générateurs particuliers d'électricité.



27 OCTOBER 1981

## EXPOSITION D'ÉLECTRICITÉ

viii

**ÉCLAIRAGE ÉLECTRIQUE**

### Systeme Edison.

## II.

[illegible][illegible]

très bon marché; l'interposition de cette matière entre les deux barres et les parois du tuyau-enveloppe a pour but d'empêcher toute déperdition d'électricité.

Ne courant plus dans les conduites par les tuyaux-barres, les conducteurs de traction sont maintenant piégés. Au lieu d'être pour tous les conducteurs employés, dans l'usine, construits sur le modèle des conducteurs de branchement sont, en fait, très gros comme le médium de la main, les conducteurs d'accrochage dans les machines, les conducteurs de traction, les conducteurs de diverses sections, se trouvent, facilement, à chaque croisement de rue, les tuyaux pénètrent dans une étroite interposition, dans la canalisation. Les franges de suif, s'y montrent à l'œil, dans l'interieur.

On racle, par les faces, les conducteurs, les conducteurs d'air, les conducteurs similaires de la conduite, maîtres, et même les conducteurs de retour à sens

Non entre, les conducteurs, empêche le courant de passer et pare à toute éventualité. La lame de plomb sert d'appareil de sûreté : on l'appelle en Amérique cut-

Le raccord entre les conduites de la rue et le tuyau d'accès des maisons s'opère de la même manière à travers une boîte également munie de la lame de plomb préservatrice pour plus de sécurité. Enfin les conducteurs, particuliers de chaque maison, se réduisent à de simples fils isolés par du caoutchouc et qui rayonnent dans tous les appartements.

Les lampes sont disposées sur des appliques, sur des candélabres, sur des appliques mobiles, sur des chandeliers. Dans tous les cas, leur ligne est les fils qui les soutiennent, soit par le même moyen, l'extrémité du globe de verre, soit avec du plâtre dans une série d'anneaux, soit avec des anneaux de métal, soit avec la communication avec une des viroles ou des anneaux de la lampe. Le premier est le second, il relie à l'autre virole paraitrait isolé de la première; on retrouverait la lampe, on la soutiendrait par un support un fil de plomb qui sort d'un trait d'union entre le fil d'accès du courant et la virole qui établit la communication avec la lampe. On a besoin, en fondant, il comprimer le circuit et empêcher le courant de détériorer la lampe son support par un trop grand échauffement. On a vu, dans les lampes à oblique bras d'appuyer par une clef, une analogie au robinet de gaz. Quand on fait tourner la clef, les contacts se font, les lampes sont allumées, on a vu le circuit souverain et la lumière brûle et la lampe s'allume. La manœuvre revient rompt toute communication et éteint la lampe. On a vu la lampe dans l'apartement, plus de la moitié

L'analogie avec le gaz se poursuit dans tous les détails: avec cette différence essentielle ici que, le robinet fermé, le gaz reste toujours dans les tuyaux prêt à s'échapper, et à produire des explosions. L'électricité ne grouille plus, la cloie fermée et d'ailleurs si elle circule elle ne pourrait amener aucun accident. La cloie est conique et à large surface de façon à atténuer l'effet de la petite étincelle électrique qui se produit toujours quand on rompt le courant.

Dans la seule maison, ce système est appliqué à deux grandes lustres à orfèvres et à 80 bras, installés le long des murs. 160 lampes brillent tous les soirs.

Le nombre des lampes sera augmenté dans quelques jours; on doit placer un nouveau lustre de 144 lampes, des candélabres de 25 lampes et des girandoles à 4 lampes sur le palier du grand escalier. Plusieurs expositions du rez-de-chaussée sont éclairées aussi avec des lampes Edison.

Voilà également pour la canalisation et la distribution à domicile. Il est superflu d'ajouter que les dimensions relatives des conducteurs sont déterminées par le calcul. Le diamètre des conducteurs à grosse section dépend de la longueur de la canalisation totale, et les diamètres des conduites secondaires sont eux-mêmes fixés d'après la grosseur de conduite principale. Tout se tient. Comme la canalisation est évidemment plus simple que celle du gaz. Les tuyaux — exigent plus pour leur pose de profondes tranchées; on peut les établir dans les égouts ou dans des caniveaux — on borde

Quelques lignes maintenant sur l'usine centrale. Nous y retrouverons nécessairement

[illegible]

(1) Il importe, en effet, que la résistance interne que présente la machine au passage du courant dans les spires soit diminuée autant que possible. Il faut donc des fils à large section. En effet, si l'on désigne par  $l$  la résistance d'une lampe à incandescence, et par  $x$  le nombre des lampes, la résistance dans toute la canalisation sera

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Intensités est immédiatement indiqué.

Il nous reste encore un dernier point à élucider. On paie le gaz en raison de la consommation journalière. Et l'électricité, comment appréciera-t-on la dépense? Chaque maison, chaque appartement même aura son compteur d'électricité comme aujourd'hui son compteur à gaz. Ces petits appareils figurent dans la section d'Edison au Palais; ils sont mignons et de dimensions réduites.

On a sous les yeux une boîte métallique d'environ 25 centimètres de hauteur sur 20 de largeur et 12 centimètres d'épaisseur. Placée verticalement, elle s'ouvre à deux battants comme les deux portes d'une armoire. Elle est partagée intérieurement par une cloison verticale en deux compartiments dans

chacon desquels on trouve un petit flacon plein d'une dissolution bleue de sulfate de cuivre. Chacun flacon renferme en outre deux lames d'acier, l'une desquelles est plongée dans le réservoir d'une solution dans la maison. Une petite fraction, toujours constante, du courant central, passe par les lames au sein de la solution cuprique et la décompose; du cuivre se dépose sur une des lames. Le travail chimique effectué mesurant exactement l'énergie du courant utilisé dans la maison, il suffit de peser le dépôt de cuivre pour évaluer la quantité d'électricité qu'on a dépensée. Tous les mois un agent ouvre le compteur de droite dont il a la clef et pèse le cuivre. Tous les ans, on conclut avec le propriétaire de la maison d'après la clef et la balance de gauche deux dépense, la somme des pesées mensuelles doit être égale, comme vérification, à la somme annuelle.

variations de température dépassent une certaine limite pour que le procédé de mesure reste exact; aussi, M. Edison a-t-il introduit dans chaque compartiment une de ses petites lampes : une tige métallique à deux bouts inégalement dilatables se courbe sous l'action du froid et établit un contact entre la lampe et une prise de courant. La lampe s'allume et chauffe le compteur à une température sensiblement constante. Tout, comme on voit, a été prévu et parfaitement résolu. Qu'il s'agisse de lumière ou de force transmise, tout abondamment payé on raisonne l'électricité lui aura donné sa note.

Tal est dans ses grands traits le mode de production, de canalisation, de distribution et de mesure de l'électricité, imaginé par M. Edison.

clairage le prix de revient ?

Il est incontestable que la lumière par incandescence est de beaucoup plus chère que la lumière par arc voltaïque. Chaque fois que l'on multiplie les foyers, on accroît le nombre des charbons à échauffer, on augmente les pertes de chaleur, les surfaces de rayonnement, les résistances dans le circuit, etc., ou doit forcément, avec la même force donner moins de lumière. Bien que la dissémination des lampes permette de regagner un peu par une meilleure distribution de la lumière, il n'en est pas moins vrai que la division aboutit toujours en principe à un rendement faible.

Il en est de même pour le gaz. Un petit bec consomme relativement beaucoup plus qu'un bec puissant.

pour 300 litres, 6 carrels; pour 600 litres, 14 carrels; pour 800 litres, 23 carrels; pour 1,600 litres, 47 carrels. On voit la dépense diminuer avec l'intensité, d' foyer.

Une lampe par incandescence donne par cheval, et par heure, 20 carcols d'électricité, tandis qu'un set de foyers électrothermiques peut fournir par heure jusqu'à 280 carcols. On admet qu'en moyenne le rendement de la lumière par incandescence est plus de dix fois moindre.

comparé à celui du gaz. La lumière électrique est moins obère que celle du gaz, qu'il s'agisse de l'énalragie par arc ou même par incandescence.

En brûlant directement 4 mètres cubes de gaz dans un bec, on ne peut produire au delà de 40 calories. Si l'on dépense cette même quantité de gaz pour faire de la force dans un moteur Otto, on obtient quatre che-

un moteur Otto, on obtient quatre chevaux de force qui, transformés en électricité par une machine Gramme et en lumière par un régulateur Serrin, donnent une puissance lumineuse de plus de 30 becs Carcel, en dégageant 150 fois moins de chaleur.

ou sa maison avec les lampes à incandescence; sans attendre l'établissement d'une canalisation générale, n'aurait-il pas à installer chez lui, dans son salon, une machine à gaz de ville?

deux-fois, une machine à gaz de un cheval. La machine dépense par heure et par cheval 1 mètre cube de gaz, 1 mètre cube d'eau et 1 mètre cube de vapeur. Elle fournit avec les lampes Edison 20 carcel ou allume 20 lampes de 1 carcel. 1 mètre cube brûlé directement dans des bacs de 1 carcel ne fournirait que 7 à 8 carcel. En ne tenant pas compte l'intérêt du prix du moteur et de

machine, et de l'amortissement, on obtient drait à Paris la lumière de 20 carcel pendant 30 centimes, soit 1 centime et demi par carcel. Le bon carcel gaz coûte environ 4 centimes. Avec les intérêts et l'amortissement, pour le système mécanique revenant à peu près à 6,000 fr., et pour un éclairage de 3,000 heures par an, on trouve comme prix de revient environ 2 centimes par carcel et par heure.

Lorsqu'on produira l'électricité par des machines à vapeur puissantes, la dépense en charbon étant réduite par force obéissant à 1 kilogramme, et le kilogramme de bouille coûtant 5 c. environ, si l'on ne tient pas compte des frais de canalisation,

Il est impossible en ce moment de préciser des chiffres définitifs parce que tout dépend évidemment de la longueur du réseau et de sa densité, c'est-à-dire

nous n'ayons pas fait la part assez large à l'imprévu et aux dépenses de premier établissement. Au pis aller, doublons ce chiffre, nous arrivons à une dépense par enrol d'environ un centime et demi à deux.









# EXPOSITION INTERNATIONALE D'ÉLECTRICITÉ

Compte rendu des visites faites à l'Exposition par les Ingénieurs, anciens élèves de l'École centrale, et reproduction sténographique des conférences des exposants.

Le groupe de Paris de l'Exposition antécédente des anciens élèves de l'École centrale des Arts et Manufactures a pris l'initiative de visites aux différentes classes de l'Exposition internationale d'électricité. Ces visites ont lieu chaque samedi, à dix heures du matin, et sont précédées de conférences ou causeries destinées à exposer les principes des appareils auxquels la visite est consacrée.

C'est un résumé sténographique de la causerie qui a précédé la visite du 3 septembre que nous reproduisons ci-dessous.

## LES GÉNÉRATEURS MÉCANIQUES D'ÉLECTRICITÉ

Le séminaire est ouvert à 10 heures.

M. HOSPITALIER. — Messieurs et chers camarades :

On ne connaît rien de la nature intime de l'électricité, mais sans vouloir faire aucun hypothèse sur sa nature, on peut considérer l'électricité dynamique, la seule qui nous intéresse au point de vue industriel, comme un véritable écoulement électrique qui s'effectue à travers des conducteurs, sous l'action de causes diverses, actions dont le nombre se réduit pratiquement à trois :

1<sup>o</sup> L'action chimique, où il y a combustion du zinc dans un acide ;

2<sup>o</sup> L'action qui résulte du chauffage de la surface de deux métaux hétérogènes et qui produit aussi un courant ; c'est la *thermo-électricité* ;

3<sup>o</sup> Le mode le plus employé, c'est la transformation du travail mécanique en électricité ; c'est de ce mode dont nous allons nous occuper aujourd'hui.

Avant de parler de cette transformation, je voudrais dire quelques mots des qualités spéciales du courant.

Dans une circulation électrique, il y a lieu de considérer l'intensité, le volume si on veut, de l'électricité qui traverse un conducteur ; la tension ou pression de l'électricité aux extrémités de ce conducteur et la résistance qui s'oppose à l'écoulement de l'électricité en vertu de la nature du conducteur interposé.

Ces trois éléments se retrouvent en hydraulique, dans la chute d'eau capable de produire un travail déterminé. Nous avons le volume d'eau qui s'écoule dans l'unité de temps ; c'est le débit ou seconde qui correspond à l'intensité électrique ; le pression qui représente la force électro-motrice et la résistance qui représente le frottement des conduites.

En électrostatique ces trois éléments ont reçu des noms et se mesurent à l'aide d'unités connues.

L'unité d'intensité, c'est-à-dire la quantité d'électricité qui s'écoule dans un conducteur, pendant l'unité de temps, se nomme le *weber* ; le volume l'électricité en *webers* ou en *milliwebers*, lorsqu'il s'agit de courants électriques faibles, tels, par exemple, que les courants télégraphiques.

L'unité de pression ou force électro-motrice, en vertu de laquelle s'établit le courant, se nomme volt. Cette force électro-motrice est comme de la pression en hydraulique qui varie avec la hauteur de la chute d'eau.

On compte par volts, comme on compte en mètres de hauteur d'eau.

La résistance offerte à l'électricité dans l'écoulement se conduit s'exprime en ohms ; un conducteur a tant d'ohms de résistance.

Les machines, au point de vue de l'ingénieur, peuvent se diviser en deux classes distinctes : les machines à grand volume et à petite chute. Ce sont celles que l'on utilise pour la galvanoplastie ; il y en a un bel exemple dans la section ultérieure.

Les machines Gramme employées par M. Jamia, pour ses longues ors, ou courtes, à petite volume et une haute pression ou tension, il y a, pour une même somme de travail dépensé, deux facteurs qui varient pour donner un produit constant.

Telle est, au point de vue de l'ingénieur, la division qu'il faut établir : nous verrons qu'il y a, au point de vue industriel, d'établir une autre classification.

Je tiens à faire cette distinction importante entre les deux facteurs d'une circulation électrique, parce qu'on entend souvent dire dans le langage ordinaire et d'une façon inexacte : voilà une machine qui produit beaucoup d'électricité et une machine qui se produit peu.

Cette expression est absolument impropre, parce que l'intensité ou la quantité d'électricité produite par une machine ne représente qu'un des facteurs du produit ; c'est le produit qui détermine la puissance de la machine.

Examinons maintenant par quels moyens on transforme le travail mécanique en énergie électrique.

Jusqu'en 1839 on ne connaissait aucun rapport entre le magnétisme et l'électricité.

Ce n'est qu'en 1839, que *Crosted* reconnut que si on place un conducteur traversé par un courant au-dessus d'une aiguille aimantée, dirigée vers le Nord, cette aiguille tend à se mettre en croix, avec le courant.

Telle fut la première relation, entre le magnétisme et l'électricité établie par *Crosted*, qui montre qu'un courant a une action sur un aimant.

Cet action dont la découverte fit naître l'électromagnétisme, fut ensuite étudiée et développée par *Ampère* qui arriva à ordonner toute une science qu'on appelle l'électrodynamique.

Les résultats de études d'*Ampère* et d'*Arago* établissent parfaitement les lois qui régissent les actions des aimants sur les courants et l'action des courants sur les aimants. Mais il n'y a pas encore production du courant par un aimant et c'est grâce de la découverte de *Faraday* que date l'industrie ; c'est lui qui découvrit qu'un déplacement une bobine de fil, ou un aimant, un simple fil, devant un aimant, ou bien en déplaçant un conducteur dans un champ magnétique, il se produisait dans ce conducteur un courant instantané ou courant d'induction.

Mais pour faire passer le fil devant un aimant dans le champ magnétique, il y a à dé-

placer l'énergie. Le champ magnétique est l'espace qui entoure l'aimant et n'a d'action que dans une sphère étroite autour de l'aimant.

Ainsi donc ce principe général : faire passer plus ou moins rapidement un fil devant un aimant, dans un champ magnétique, principe qui a été développé d'une façon remarquable, ce principe, dit-on, est l'origine de la transformation du travail mécanique en énergie électrique.

Si, au lieu de faire passer le fil dans un champ magnétique, on augmente le magnétisme du barreau, on change la répartition de magnétisme au point de vue absolu, on équivaut au déplacement d'un conducteur dans un champ magnétique.

Nous allons voir par quels modes divers on réalise ces conditions dans les machines pour la production des courants.

La puissance des courants dépend de la puissance du champ magnétique, de la vitesse de déplacement, etc. Ces courants sont instantanés. On est donc obligé, pour les avoir continuellement, d'avoir une grande quantité de bobines qui se déplacent devant ou entre les pôles d'un aimant. Il y a, par chaque tour, deux courants qui traversent le fil en sens inverse. Si donc, vous faites tourner très vite la bobine, les intensités du courant dépendent à chaque instant des conditions dans lesquelles se trouve la bobine, de sa vitesse relative, de l'intensité du champ magnétique, etc.

Ces courants se propagent tantôt dans un sens tantôt dans un autre ; ils sont *alternatifs*. En traçant la courbe des intensités à chaque instant, on peut les représenter par une sinusoïde dont les deux points de recroisement passent par l'axe des x.

Les courants alternatifs n'ont plus aujourd'hui qu'une seule application, à la ventilation importante, pour la production de la lumière électrique.

Beaucoup d'inventeurs emploient ces courants pour l'éclairage électrique, parce qu'étant successivement positifs et négatifs, ils sont les charbons également et évitent ainsi le déplacement du point lumineux qui a lieu avec les lampes à arc. Les courants continus demandent le plus négatif d'une enveloppe dont les métaux qui le pôle positif. En faisant passer une bobine devant un aimant on dépense un certain travail électrique. L'énergie électrique produite, se sou-

vient à l'énergie électrique par la loi de *Leont* du *facteur d'induction* par la loi de *Leont* qui peut s'exprimer ainsi :

Lorsqu'un circuit traverse un champ magnétique, il se produit un courant tel qu'il tend à gêner le mouvement ; c'est le principe de la conservation de l'énergie que l'on retrouve ici exprimé sous une forme nouvelle.

En effet, puisque le courant tend à gêner le mouvement, c'est qu'il y a une dépense d'un travail mécanique pour la production d'une quantité déterminée d'énergie électrique dans le circuit, sous forme d'un certain volume d'électricité s'écoulant avec une certaine pression.

Il y a analogie avec une certaine pression, qui produirait une circulation dans

# L'ACTUALITÉ

## INDUSTRIELLE, COMMERCIALE, FINANCIÈRE ET ARTISTIQUE

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### AVIS

En raison de la bonne fortune que nous échoit d'un compte rendu spécial de l'Exposition internationale d'Electricité, nous ferons paraître dorénavant le journal le jeudi.

Nous saisissons cette occasion pour prier ceux de nos abonnés qui ne nous ont pas encore transmis le montant de leur abonnement, de le faire sans retard; nous recommandons aussi à tous de nous adresser leurs réclamations, s'ils ont à se plaindre d'insuccès ou de retard dans la réception du journal.

N. B. Les abonnements peuvent être transmis par le poste, les frais à notre charge.

### ACTUALITÉ INDUSTRIELLE

#### L'EXPOSITION INTERNATIONALE D'ÉLECTRICITÉ

##### NOTES NOUVEAU COMPTE RENDU

Ainsi que nous l'avons fait espérer dans notre dernier numéro, nous venons maintenant le moyen de donner à nos lecteurs le compte rendu le plus utile et le plus instructif de la grande exhibition scientifique des Champs-Élysées.

Les ingénieurs, anciens élèves de l'École centrale, toujours à la hauteur de leur mission et à la piste des découvertes et inventions, ne pouvaient se désintéresser du grand mouvement de progrès que l'Exposition d'Electricité va occasionner. Les membres réunis en assemblée spéciale du groupe de l'art ont décidé de faire chaque samedi une conférence sur un sujet donné, conférence suivie d'une visite dans les galeries où la théorie sera appuyée par les expérimentations pratiques.

Ce sont ces conférences courtoises que l'« Actualité » donnera chaque semaine; le compte rendu photographique donne en revanche toute la conférence du samedi précédent.

Comme des travaux de ce genre ont une importance plus grande que n'importe quel article du journal et sont appelés à être consultés, surtout plus tard, quand l'Exposition sera

close, nous avons décidé de consacrer à ces monographies toute notre feuille intermédiaire avec une pagination spéciale; il suffira de conserver soigneusement ces feuilles séparées auxquelles nous adjointons à la fin une table et un titre, pour avoir à un moment donné, un recueil du plus haut intérêt et de la plus grande valeur.

Heureux d'offrir à nos lecteurs, sans la moindre augmentation de prix, cet élément nouveau d'instruction et d'intérêt, nous nous osons de transmettre à l'association amicale des anciens élèves de l'École centrale (groupe de l'art), et à son dignitaire Président, l'hommage de notre gratitude.

La Rédaction.

### NOUVELLES DIVERSES

Il est que gratuites périodiquement d'un travail technique important, nous continuons à enregistrer les nouvelles annonces se rapportant à la grande Exposition et à consigner et à commenter aussi bien le résultat de nos visites que celui de nos lectures.

Signalez-nous aujourd'hui la publication en brochure, chez Lathure, d'un *Exposé sommaire et de Notes sur les différents plans de l'Exposition*. Ces travaux courts et substantiels, par leur très facile à lire et à assimiler, sont dus à des électriciens et à des experts de premier ordre. Nous remarquons parmi eux les noms de MM. Armand, Ed. et J. Desquerres, l'Ér, Ant. Iraguet, Deprez, Hipp. Fontaine, etc., etc.

— Soutenons aussi la bienvenue à un nouveau contraire, le *Moniteur officiel de l'Electricité*, qui, malgré les prétentions apparentes de son titre, n'a aucunement l'intention aux fautes méthodiques qui se consacrent à l'étude des questions relatives à l'Electricité. Dans le mouvement qui s'accomplit de jour en jour, un journal bien fait et personnel sera leur un élément essentiel et pourtant bien venu. Les deux numéros du *Moniteur officiel* que nous avons sous les yeux sont très soignés et bien conçus. A première vue, on pourrait croire à une *Monographie d'Edison* en facécules, mais la réflexion, en comparant ce grand maître américain à celui qui a fait une place à part dans le monde avant et dans l'histoire des Champs-Élysées par la variété et l'importance

de ses découvertes, n'est que juste de le mettre en bien place dans un recueil spécial.

Donc, bonne chance à notre nouveau confrère et espérons qu'il survivra à l'œuvre importante dont il s'est le maître.

Parmi les applications les plus remarquables de la lumière électrique, il faut citer celles qu'on voit en faire aujourd'hui pour exécuter des clichés photographiques quand la lumière solaire fait défaut, et pour produire des agrandissements de portraits photographiques dans des conditions toutes spéciales comme ont les exécuter aujourd'hui avec tant d'habileté le célèbre photographe Pierre Petit. Cet opérateur emploie à l'exposé des nombreux appareils des procédés d'agrandissements photographiques qu'il exploite sous le nom de *lithographie*, et qui sont bien dignes de l'attention du visiteur. La *lithographie* s'exécute à l'aide de la lumière électrique, en place d'une lampe à incandescence, le plus de l'industrie. Les avantages de ce procédé sont considérables, ils ont déjà été mis en évidence par un appareilateur dont nous n'avons qu'à reproduire les expressions. Le *lithographe* met en évidence un fil ligneux, imprimé le mouvement de la vie au sein des lamelles et des lamelles.

Quant à l'image obtenue, en solidité est certaine. Une telle pareille à celle qui s'emploient dans les peintures, les dioramas, les lanternes magiques de configuration n'en conservent pas moins leur rapidité qu'elles ne perdent.

Comme application au portrait, la *lithographie* fait tout le jour ses preuves. L'Exposition de l'Exposition de l'Opéra et dans les tribunes de l'Exposition de l'Opéra. Comme utilisation de Pierre Petit, le grand genre, elle offre un champ d'expériences à peu près sans limites. On conçoit que pour ne pas attendre l'écoulement d'impression récente puisse prétendre obtenir la place importante dans le domaine de la photographie de l'art. Le *lithographe* offre toutes les qualités requises pour devenir un excellent moyen de vulgarisation.

Les visiteurs du *lithographe* de l'Exposition de l'Electricité, s'occupent de la photo qui les concerne, les photographes s'occupent de la photo qui les concerne, les photographes s'occupent de la photo qui les concerne.

# MONITEUR OFFICIEL DE L'ÉLECTRICITÉ

REVUE HEBDOMADAIRE ILLUSTRÉE DES ARTS, DES SCIENCES ET DE L'INDUSTRIE

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COCHERY (LOUIS-ADOLPHE).

Ministre des Postes et Télégraphes

PRÉSIDENT DU CONGRES INTERNATIONAL D'ÉLECTRICITÉ



## COCHERY

Dans un journal destiné spécialement comme le nôtre à vulgariser les applications utiles de l'électricité, la place d'honneur revenait de droit au ministre des télégraphes, au président du congrès international des télégraphistes, au créateur de cette Exposition qui, par ses splendeurs et ses bienfaits, laissera dans toutes les mémoires un souvenir impérissable. D'autres titres encore recommandaient à nos premiers hommages l'homme éminent dont nous allons retracer la laborieuse et si utile existence, entièrement dévouée aux intérêts populaires, nous ne pouvions, en effet, oublier ni méconnaître les services rendus par l'honorable M. Cochery à la cause de la démocratie. Chacun des obscurs mais sincères du progrès, nous avons su apprécier la valeur des réformes proposées par l'ancien rapporteur général du budget, et l'importance des améliorations réalisées par le ministre. Mais des circonstances imprévues nous ont forcés d'ajourner le témoignage de haute estime et de profonde gratitude que nous sommes heureux de vous donner ici l'un des plus féroces et des plus dignes serviteurs de l'idée républicaine. Notre satisfaction à nous acquiescer de ce que nous considérons comme une dette de conscience est d'autant plus vive, que M. Cochery appartient, lui aussi, à la phalange des futurs et des plus dignes serviteurs de l'idée républicaine. Notre satisfaction à nous acquiescer de ce que nous considérons comme une dette de conscience est d'autant plus vive, que M. Cochery appartient, lui aussi, à la phalange des futurs et des plus dignes serviteurs de l'idée républicaine. Notre satisfaction à nous acquiescer de ce que nous considérons comme une dette de conscience est d'autant plus vive, que M. Cochery appartient, lui aussi, à la phalange des futurs et des plus dignes serviteurs de l'idée républicaine.

M. Cochery est, sans contredit, le plus sympathique et le moins critiqué des membres du gouvernement. D'une bienveillance vaillante paternelle envers les employés de sa vaste administration ; soucieux des intérêts publics, et toujours prêt à accueillir avec bonté les réclamations légitimes ; sans cesse en quête de modifications propres à faciliter le service et à procurer au commerce de nombreux avantages ; très versé dans les questions économiques et sociales, et dans la pratique des affaires, facilement abordable et sans morgue aucune, M. Cochery offre le type, malheureusement trop rare, de l'homme d'État dans une vraie république. M. Cochery (Louis-Jérôme) est né à Paris en 1820. Il appartient à une honorable et riche famille de la bourgeoisie. Placé au collège Bourbon, il y fit d'excellentes études et fut remarqué par son assiduité au travail et la vivacité de son intelligence. Il quitta le collège pour entrer à vingt ans, avec le titre de licencié, dans la profession d'avocat et avait déjà obtenu un barreau des succès sérieux, lorsqu'éclata la révolution de février. Nommé chef du cabinet du ministre de la justice, il fut chargé, dans la nuit même du 21 au 25 février, d'aller annoncer à la loi, d'organiser la manifestation militaire pour subvenir aux besoins urgents de la population ouvrière. Dans cette circonstance, Cochery donna une preuve remarquable d'activité et d'esprit pratique, qualités qui distinguent éminemment

notre ministre des postes et télégraphes. En quelques heures, il réussit à faire confectionner soixante mille rations, dont la distribution, on se l'imagine, fut accueillie avec des transports d'enthousiasme.

Les journaux de juin ayant provoqués des changements dans le personnel gouvernemental, Cochery abandonna le ministère de la justice et revint prendre sa place au barreau, malgré les offres brillantes qui lui étaient faites et les sollicitations de protecteurs puissants pour le lancer soit dans la magistrature, soit dans l'administration. Dès ce moment, le futur ministre commença la lutte qu'il a continuée avec persévérance et un dévouement à toute épreuve, sous la présidence et pendant la durée de l'empire, pour le triomphe des idées démocratiques. Il s'adonna spécialement aux procès politiques et défendit avec autant de talent que de courage un grand nombre de journaux et notamment *la Voix du peuple* et *la Réforme* contre lesquelles l'autorité exerça les plus vives persécutions.

A partir de 1856, Cochery, qui comprenait que, dans la situation présente, la plume serait plus efficace que la parole, se voua presque exclusivement au journalisme militant, et lorsque, en 1868, l'essai loyal de l'empire constitutionnel et libéral relâcha les liens dans lesquels la presse avait été ensermé jusque là, il profita de l'occasion pour fonder *l'Indépendance du Nord* dans ce fait bien tenté d'un des meilleurs organes de l'opposition parmi les journaux de province. Son ardeur et son habileté au combat lui valurent une grande popularité, et l'opposition démocratique le récompensa de ses généreux efforts en l'envoyant à la Chambre des députés, aux élections de mai 1869, en dépit des attaques acharnées de l'administration impériale qui avait mis à ses trousses deux candidats *agréables*.

Aussitôt entré à la Chambre, le nouveau député prit une part active aux discussions d'affaires, et, bien qu'appartenant aux rangs de l'opposition avancée, il fit partie de la commission du budget, où il donna de nombreuses preuves de ses remarquables aptitudes.

Lors des douloureux et instructifs événements de 1870-1871, Cochery fut envoyé en qualité de commissaire de la défense nationale dans le département du Lot-et-Garonne, et l'invasion prussienne l'ayant contraint d'abandonner son poste, il accompagna à Versailles M. Thiers dans l'insulte voyage qu'il entreprit pour arriver à des négociations pacifiques.

Aux élections du 8 février, Cochery arriva le premier sur la liste avec soixante mille voix sur soixante-neuf mille votants. Son prestige, comme on le voit, n'était pas amoindri dans ce département resté fidèle jusqu'au bout à son digne et indigne représentant. A l'Assemblée nationale, il n'a cessé de s'occuper d'une manière assidue des questions d'affaires. Membre, continuellement réélu, de la commission du budget, il a été choisi à plusieurs reprises comme rapporteur des budgets de la guerre et l'intérieur.

Aux élections du 30 février 1876, Cochery a été élu par plus de quatre mille voix. Aucune candidature n'aurait osé s'élever en face de la sienne.

La commission du budget de 1876, présidée par M. Gambetta, le désigna comme son premier vice-président et rapporteur général du budget de 1877. C'est sur son rapport qu'inaugurant une nouvelle ère financière par le dégrèvement des

impôts, la Chambre réduisit de 7 millions pour l'année 1877 le taux duquel s'élevait à un impôt traditionnellement impopulaire. Il se qualifiait en même temps les grands traits d'une situation ou d'une politique qui allait permettre de larges dégrèvements. Les incrédules d' alors doivent s'incliner aujourd'hui en présence des dégrèvements qui ont été réalisés et que, dans sa sagacité et sa prévoyance, Cochery annonçait depuis plus de dix ans. La commission du budget de 1878 le choisit encore comme rapporteur général, et c'est en cette qualité qu'il refusa le vote du budget, au nom de la commission, aux approbations de la Chambre et du pays.

Rapporteur général des budgets de 1877 et de 1878, président de deux grandes commissions de chemins et de la commission parlementaire qui s'est occupée de l'Exposition universelle, membre élu par la Chambre du conseil de surveillance de la Caisse des dépôts et consignations, M. Cochery s'était placé au premier rang des travailleurs de l'Assemblée.

Nous ne pouvons énumérer tous ses rapports. Il est toutefois intéressant de rappeler que, dès le 1<sup>er</sup> trimestre de 1876, s'expliquant dans un rapport sur le projet du gouvernement de revenir aux anciennes taxes postales de vingt centimes, il proposait à la Chambre de frapper de plus grands crédits. En même temps, il réclamait quinze centimes de plus sur les lettres au sein de la commission de budget la réduction de nos taxes télégraphiques. C'est sur ces entrefaites qu'arrivèrent le 10 Mai et la dissolution de l'Assemblée. Bien entendu, il signa les manifestes des 79 et 80, comme membre du bureau de la gauche, les autres manifestes adressés aux pays par les bureaux des groupes républicains.

Pendant la période électorale, M. Cochery, représentant de l'arrondissement habité par le maréchal de Mac-Mahon, se trouva en butte aux mêmes procédés qui avaient été employés contre lui en 1869. Mais toutes les menaces de l'administration ne purent intimider ni tromper ses conclusions. Son concurrent échoua prochainement.

Nous terminerons dans notre prochain numéro cette étude de la vie parlementaire si bien occupée, comme on a pu juger, de l'honorable ministre des postes et télégraphes.

## THOMAS-ALVA EDISON

## SON ŒUVRE

II

Dans le numéro précédent, nous avons raconté la vie d'Edison. Peut-être aura-t-on trouvé que nous nous étions vengés avec un peu trop de complaisance dans ce récit des faits mémorables à divers titres qui jalonnent la carrière du fameux inventeur ? Que de détails dignes d'être rapportés, il nous n'en a fallu qu'un dans ce monceau de documents précieux et si sincères où l'obligation de notre biographie et l'absence nous ont permis de feuilleter et de réserver Combien d'épisodes curieux, d'anecdotes et de traits caractéristiques nous avons dû taire, à regret, afin de rester à peu près dans les limites assignées par les dimensions de cette feuille à l'expansion de notre enthousiasme ! Ne serions-nous pas, d'ailleurs, bien excusable d'avoir cru que le lecteur ne regretterait pas indifférent même

aux minces éléments remplis sous toutes ses encore à la fin d'un œuvre d'art d'importance.

Et puis, on ne peut le sinner que la symphonie même temps à chaque pas individualités pulsantes de cord d'un be sord est reconnu Edison tel qu'il vaillant, tout dévoué à l'exaltation de la légende d'ose à si simple à difficile, nous donc notre co heureux de connaître Mais il est frontispice de leur courage.

Jamais le en situation.

Par une commissionnaire d'abord tout a été placée du saint apside latine, découvertes un conte in

En pouva train-à-mune ? Le photographier avertissement frapper de dre, jusqu' Aujourd'hui venu de « mesurer au des des réductent en s'insurgent annonces dans le d'.

Qu'on ne clusivisme Edison et cie de l'œuvre pour cela courants, et verra à l'indiquer le mette, par mais que grandiosité une foule testable, agent de tèmes leurs avers récom Sur la plus tiques l'électr phor unique cur

aux minces incidents d'une science aussi largement répandue, et qu'il aimait à envisager sous toutes ses faces et *proleptique*, non parvenu encore à la maturité de l'âge, qui déjà accompli une œuvre gigantesque et dont la gloire fera pâlir bientôt les renommées les plus éclatantes.

Et puis, on le comprendra, naufrageur d'autant plus de peine à nous séparer de notre "sujet", que le sympathique pour l'homme d'accroissement en même temps que l'admiration pour le savant à chaque pas dans cette double étude d'une des individualités les plus originales et les plus puissantes des temps modernes. Rarement "l'accord d'un beau talent et d'un beau caractère" s'est rencontré aussi parfait; et après avoir vu Edison tel qu'il est réellement aimable, bienveillant, toujours accessible à tous, généreux et dévoué à l'œuvre, brave jusqu'à la folie, insouciant de la richesse et de la gloire, sans la plus légère dose de vanité ou de jalousie, en un mot, si simple à la fois et si grand! nous a été difficile, nous l'avons, de contenir l'émotion dont notre cœur était rempli et que nous serions heureux de communiquer à tous ceux qui ne connaissent encore que l'inventeur de génie. Mais il est temps d'examiner son œuvre, au frontispice duquel on pourrait gravir : « LE VRAI PEU D'ÉLÉMENTS N'ÉTRE PAS VAINEMENT LAISSE ».

Jamais le vers de Boileau n'aurait été mieux en situation. Par une coïncidence assez bizarre, Edison, ce missionnaire du progrès, destiné à provoquer d'abord tant de protestations et de défiances, a été placé à sa naissance sous le patronage du saint apôtre de l'Éternité : *Vide Thomas, vide Iesus*, etc. À la naissance de chacune de nos découvertes, il semble, en effet, que l'on écoute une conte imaginaire pour émerveiller des enfants.

En pouvait-il être autrement, et notre *extra-hy* espérait-il échapper à la loi commune? Le bon homme imagine que l'apparition du phonographe faisait faire à la science, sans avertissement, à l'improviste, ne devait-il pas frapper de surprise et désarçonner, pour ainsi dire, jusqu'à ses adeptes le mieux préparés? Aujourd'hui même qu'il est loisible au premier venu de "mettre le doigt dans la plaque" et de mesurer avec une certitude mathématique l'étendue des résultats acquis, nombre de gens suspectent encore le témoignage de leurs sens et s'insurgent d'avance contre la réalité d'inventions annoncées et dont l'application tombe demain dans le domaine public.

Qu'on ne se hâte pas de nous accuser d'exclusivisme et de parti-pris. Si nous exaltions Edison et si nous le plaçons à la tête des physiiciens de l'époque, nous ne méconnaissions pas pour cela l'importance des travaux de ses contemporains, et la suite de cette publication prouvera à l'évidence que nous n'hésitons pas à signaler les services rendus et à décerner au mérite, partout où il se trouve, le légitime hommage qui lui est dû. Certes, les inventions grandioses ou ingénieuses abondent à l'Exposition des Champs-Élysées. Mais il n'en faut pas rencontrer une foule d'objets d'une utilité pratique incontestable. Les adaptations de l'électricité comme agents de force et de lumière, les nombreux systèmes de télégraphie, notamment, vaudront à leurs auteurs de chaleureux digests et de légitimes récompenses.

Sur ce terrain, Edison a des rivaux dignes de la plus grande considération; mais ce qui le distingue et le classe hors de pair, c'est l'électricité, l'électro-photographie et par dessus tout, le phonographe. Là, il est original, incomparable, unique. Dans cette voie, il n'a ni précurseurs, ni imitateurs, ni passés. C'est une

véritable révélation. Devant les prodiges de cet instrument fantastique, auprès desquels tous les miracles des thaumaturges ne sont que naïvetés et jeux d'écolier, l'esprit reste comme épuisé. On en arrive presque à croire aux "papilles gélées en l'air" de Rabelais et à la réalisation de l'hypothèse physiologique de Balzac considérant la pensée comme un fluide qui se projetait au dehors et que l'on pourrait saisir sur la physiologie comme le daguerrétype se saisit dans l'espace le spectre lumineux des objets. Avec une organisation aussi extraordinaire que celle d'Edison, rien ne semble plus impossible.

Il faudrait un gros volume pour contenir l'énumération de toutes les inventions dans nous essayons de raconter l'histoire. La seule liste des brevets que j'ai pris, et il en prend chaque jour de nouveaux, occupe plusieurs colonnes de ce journal. On a vu, dans notre premier article, qu'il en comptait trente huit pour les perfectionnements apportés par lui au système Morse seulement. Ses brevets relatifs aux télégraphes automatiques et chimiques nous maintenant au nombre de trente-cinq, et il en a huit pour ses systèmes duplex, quadruplex et multiplex dont nous avons déjà dit quelques mots et qui fonctionnent au Palais de l'Industrie où ils partagent l'admiration générale avec le téléphone, le phonographe, l'électro-photographie et la plume électrique. Cette "liste" est généralisée depuis l'Exposition Universelle de 1878.

Nous ne nous arrêtons pas au téléphone, répandu partout en Amérique ainsi que l'électro-photographie, et qui va recevoir prochainement en France la plus large application, et nous allons indiquer en quel consiste ce merveilleux phonographe, qui, une fois perfectionné, est appelé à jouer un rôle considérable. C'est un simple disque vibrant, muni d'une pointe métallique qui trace sur une feuille d'étain adaptée à un rouleau qu'on fait tourner soit à la main, soit par un mouvement d'horlogerie, une série de points représentant exactement les vibrations du disque, sous l'impression de la parole humaine. Lorsqu'on a cessé de parler, on replace le rouleau à son point de départ, et on le fait tourner de nouveau. La pointe métallique repasse par la série des points qu'elle a tracés dans la feuille d'étain, le disque suit des vibrations identiques aux premières et reproduit avec une exactitude mathématique les sons qu'il a enregistrés. L'effet de la première expérience à laquelle on assiste est vraiment indescriptible, et c'est à faire douter si l'on n'est pas dupe de quelque enchantement. Devient-il en les connaissances de cette merveilleuse invention, alors qu'il sera permis d'expédier à des milliers de lieues, non plus une lettre ordinaire, mais une feuille d'étain portant l'absence la parole vivante des êtres qui lui sont chers.

Avec la plume électrique, employée depuis quelque temps déjà dans plusieurs grandes administrations de Paris pour les circulaires, un dessin, une page de musique, une lettre écrite sur du papier blanc peuvent être reportés sur une pierre lithographique et tirés à un nombre infini d'exemplaires.

Quant au téléphone et à l'électro-photographie, leur succès pratique est assuré désormais. Les expériences faites récemment par la Société des téléphones-Edison, de l'avenue de l'Opéra, dans les bureaux du ministère des postes et télégraphes et dans plusieurs gares de chemins de fer, ont été décisives. On a correspondu de Paris à Rouen, c'est-à-dire à une distance de cent quarante kilomètres, et bien qu'à cette distance

le son arrivait un peu confus, la conversation était possible. Jusqu'à quatre-vingt kilomètres, les communications sans interruption, c'est-à-dire, résultat que l'on n'obtient pas à beaucoup près avec les téléphones magnéto-électriques. Le téléphone d'Edison qui n'exige que l'emploi de deux éléments Fallot a donné des résultats bien supérieurs, quoique l'essai ait été fait dans des conditions défavorables. N'est-ce pas incroyable qu'avec un disque à savoir enfoncer dans le main et placé à six mètres, on puisse entendre la voix d'une personne éloignée de plus de vingt lieues, comme si l'on se trouvait en sa présence. Ça n'est pas tout, cependant. Grâce à l'électro-photographie, le correspondant vaut mieux qu'à haute et intelligible voix dans le régime d'oté vous l'interregne.

Le petit appareil qui restitue aux vibrations transmises par l'électro-photographie l'impulsion qu'elles avaient au départ, est basé sur une découverte qui recouvre des applications variées dans l'industrie. Le premier, Edison a constaté que lorsqu'il on fait passer un courant électrique dans deux corps qui frottent l'un sur l'autre, ce courant agit à la façon d'un corps gras et tend à le frottement. Ainsi, en enroulant un bout de fil de laiton sur des courants électriques dans les machines lourdes ou à mouvement rapide, on évitait une notable déperdition de force, moins d'usure et un travail plus régulier.

Nous allons pas à pas nous occuper d'avoir le téléphone les communications sans fil, plus rapides et complètes qu'avec le téléphone.

Edison a commencé il y a déjà longtemps, et il poursuit avec son opiniâtreté inébranlable, une série d'expériences du plus haut intérêt sur le son. Il cherche à le décomposer comme on le décompose la lumière d'un arc électrique, et constitue, c'est ainsi qu'il a construit l'aérophone qui grossit deux cent cinquante fois la voix humaine. L'instrument consiste en une embouchure semblable à celle du téléphone ou du phonographe, et le disque vibrant fait jouer la valve d'une trompette qui reproduit en amplifiant le son de la voix. Il a trouvé également le mégaphone, formé d'un porte-voix et de deux cornes acoustiques, au moyen duquel on correspond en parlant à voix basse à plusieurs kilomètres. On a pu ainsi se rendre compte que le téléphone qui transmet la parole, le phonographe qui l'enregistre et l'aérophone qui la fera entendre au public.

Il nous reste, à parler, pour nous en tenir aux inventions principales d'Edison, du progrès immense qu'il a fait faire à l'électricité, au point de vue de l'important de l'éclairage. Il a réussi à distribuer un courant électrique comme cela a lieu pour une colonne de gaz. Jusque-là, la déperdition était telle que ce qui restait de l'électricité pas la peine d'être utilisée. Cette déperdition était due à l'application de l'électricité aux usages domestiques. Le plan de la nouvelle lampe imaginée par Edison est d'une extrême simplicité. Un petit globe de verre dans lequel le vide est opéré, deux fils de platine et une tige de charbon de l'anneau recourbé en forme de fer à cheval, voilà tout. Le générateur de l'électricité est aussi simple que celui du gaz, les fils de distribution plus maniables que les conduites du gaz et d'installation moins incommodes. La lumière produite est aussi blanche et brillante que celle du meilleur gaz. Elle est continue, et fixe, sur commandement, on domine par le chaleur, on développe aussi gaz nuisible et colime morte, ce qui le gaz d'éclairage. Par la méthode d'Edison, plusieurs genres de lumière peuvent être alimentés par le même fil. Chacun d'eux est indépendant et

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1. *Journal of the American Medical Association*, 1997; 277: 1039-1043.

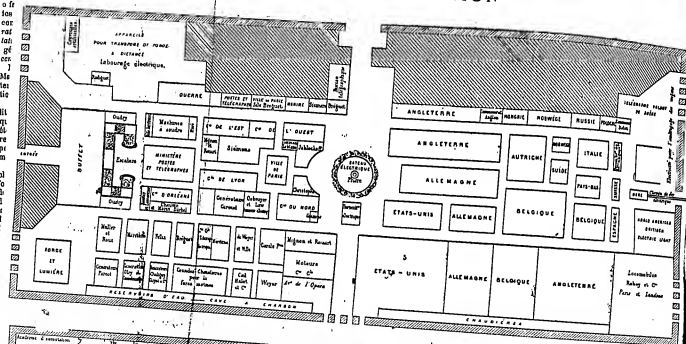
Le système Maxim a été présenté au public  
pour la première fois le 27 mai 1881,

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BISCUITS — GUILLOU — PARIS

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## LUMIÈRE ÉLECTRIQUE EDISON

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COLLABORATEURS DE M. EDISON AU PALAIS DE L'INDUSTRIE : MM. Charles BATCHELOR ET Otto A. MOSES

Pour renseignements, s'adresser aux représentants de M. EDISON

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Prix du Numéro : 35 centimes

25 Août 1884

# MONITEUR OFFICIEL DE L'ÉLECTRICITÉ

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THOMAS-ALVA EDISON







seuls perfectionnements apportés par lui au système Morse.

L'ex *train-boy*, riche et indépendant dans la pleine fleur de sa jeunesse, fait de la fortune l'esclave de sa science et de son génie. L'argent qu'il gagne lui sert à préparer des inventions nouvelles, et il continue à mener la vie d'un modeste employé. Pour pénétrer un secret de la nature, il n'hésitera pas devant une dépense à effrayer un gouvernement, et il se sacrifie ainsi plus de deux millions déjà, ce qui n'tonne pas ceux qui ont visité le splendide et incompréhensible laboratoire de Menlo-Park.

Comme tous les grands penseurs, Edison avait mené une vie très chaste. Il n'avait jamais songé au mariage, lorsqu'à Newark, où il avait établi une fabrique, il remarqua, un jour, malgré sa distraction habituelle, la douce et charmante physionomie d'une de ses ouvrières, Marie Stillwell. Le souvenir de cette vision venant souvent le hanter au milieu de ses expériences et de ses calculs les plus ardu, il commença à être pris d'inquiétude. Mais dès qu'il eut reconnu le sentiment par lequel il était dominé, son

partir fut aussitôt pris. Il propose à la jeune fille de l'épouser sans plus de phrases ni de compliments, ni de déclarations, et, après avoir prévenu qu'il viendrait dans huit jours chercher une réponse, il court se remettre au travail avec une nouvelle ardeur. Le mariage fut très peu de temps après, à l'issue de la cérémonie, Edison conduisit sa femme dans la petite maison dont elle devenait la maîtresse. Puis, lui ayant tout montré, il lui demanda la permission de la quitter pour aller surveiller dans son laboratoire une expérience importante, et s'en retourna.

Après une expérience importante, promettant d'être pleinement de retour. Ceci se passait dans la matinée. A minuit, Edison n'était pas encore rentré au logis conjugal. Il était dans son laboratoire, où il serait resté on ne sait combien de temps, si l'un des témoins de son mariage, revenant du théâtre et ayant les entrées du laboratoire éclairées, n'eût été lui-même appelé qu'il avait contracté le matin des engagements que le réclamaient un autre lieu. Ce serait, d'une exactitude absolue, achève de rendre l'inventeur dont nous venons de suivre la glorieuse carrière. Quant à l'homme, deux mots suffiront à le faire connaître: c'est le plus tendre des pères et le modèle des maris.

Le dimanche tout entier est consacré à ses deux enfants, dont il partage les jeux avec un entraîneur d'une franchise pleine d'expansion et en fait, de sorte qu'il n'interdit toute conversation téléphonique avec les visiteurs qui se présentent aujourd'hui à Menlo-Park, dans le voisinage de New-York. -Voici maintenant la petite trace de lui un de ses biographies:

« Sa physionomie, sérieuse et presque sévère lorsqu'il travaille, redevient jeune et gaie quand il cause avec des amis ou même avec de simples visiteurs. La préoccupation constante, la réflexion ont creusé sur son front une ride profonde qui s'accentue dans le travail, sa disparition n'est jamais entièrement.

\* Il a la figure complètement rasée. Ses cheveux noirs, au l'on commence à capter quelques fils d'argent, retombent sur son front en masses disciplinées. Son regard tout interne et caméléon, lorsqu'il médite au suit une expérience l'intéressante, est vif et bienveillant dans les actes de la vie ordinaire. Son sourire est franc et physiognomie sympathique.

« Il est sobre, laborieux, d'une moralité d'un désintéressement exemplaires. Il n'est pas l'argent qu'il pour les facilités de travail qu'il retire; et lorsque quelqu'un s'émerveille de sa

lui en supputant la splendide fortune que son génie lui promet, il sourit en haussant les épaules avec dédain.

« Il ne travaille ni pour l'argent ni pour la gloire. Il est profondément indifférent à ce qu'on peut dire de lui. Son seul bonheur, sa seule ambition, son but dans la vie, c'est de découvrir, d'inventer, d'élargir de plus en plus le cercle des connaissances humaines, de surprendre un à un les secrets de la nature, de faire jaillir la lumière des ténèbres.

« Il marche, confiant dans sa force, sans se préoccuper de ce que les autres ont dit avant lui. Il n'accepte que ce qui lui est scientifiquement démontré, et, pour lui, l'infirmité du plus grand génie n'a que la valeur d'une hypothèse. Lorsque la démonstration ne lui paraît pas suffisante, il envisage d'abord la question. C'est ainsi qu'il en est arrivé à rejeter une partie de la théorie de Newton sur la gravitation. Il prétend que la matière n'est pas attirée, que le mouvement est une de ses propriétés et qu'elle va dans la direction où elle rencontre le moins de résistance.

« Personne plus que lui n'a horreur des idées préconçues, des opinions faites d'avance. Il a une façon originale d'envisager les choses qui rend sa conversation extrêmement intéressante. L'un de ses axiomes favoris est celui-ci : Toutes les substances ont une intelligence proportionnée à leurs besoins. Expliquez-moi sans cela, dit-il, comment il peut se faire que le bourgeois d'une pomme de terre plantée dans une cave obscure, fasse un trajet de cinquante mètres et s'élève, contrairement aux lois de la gravitation, pour atteindre un rayon de lumière ? »

« Il a conservé le goût qu'il avait, étant jeune, pour la lecture, mais il choisit maintenant ses auteurs, et dit souvent qu'il vaut mieux lire douze fois un bon livre que lire douze ouvrages médiocres.

« En littérature, il aime les poètes d'imagination, les romantiques ; il lui faut une action dramatique et un style imagé. Il est admirateur passionné de Shakespeare et de Bulwer.

En revanche, les auteurs qui se consacrent à l'étude patiente et approfondie du cœur humain lui plaisent moins. Tout en rendant justice à leur talent, il a peu de goût pour Thackeray, Dickens, George Sand et Balzac.

« L'âme humaine l'intéresse peu ; toutes ses forces intellectuelles sont concentrées sur l'observation des lois de la nature.

« On s'imaginerait facilement qu'Edison est insatiable. Si jamais homme eut de sérieuses raisons de se saoustrer à la curiosité banale des choses, il n'en eût certainement pas porté, si vite, bien

« e. Les curieux viennent en excursion à Menla-Park comme les dévotés en France vont à Lourdes. Chaque jour des troupes de visiteurs frappent à sa porte qui s'ouvre libéralement pour tout le monde.

« Edison accueille tout le monde avec cordialité. Il fait de bonne grâce les honneurs de sa personne et de ses inventions, il n'en rien de caché pour personne. Sur le premier manège, lorsqu'on l'arrache à ses travaux, il a la figure étendue et distraite d'un somnambule qu'on vient d'éveiller brusquement; mais au bout d'un moment, sa physionomie se dégaîrit, il redevient feune; on dirait un écrouler en congé. Il cause galement avec les importuns; leur montre complaisamment ses inventions et leur expose souvent ses

projets pour l'avenir. C'est alors que sa conversation devient d'un intérêt extrême et que sa parole prend un caractère élevé. On ne se lasse pas de l'entendre. Il a une façon de parler des forces de la nature qui n'appartient qu'à lui, qu'œuvre, dans l'esprit de ceux qui l'écoutent des horizons infinis.

« C'est encore son phonographe dont il aime le mieux faire les honneurs. Il cause avec lui, l'appelle son vieux phonographe. » *How are you old phonograph?* » lui dit-il gaiement. Il tourne la manivelle et l'instrument lui répond de petite voix métallique un peu nasillard et grosse, en anglais, en allemand, un espagnol en latin, car celui qui l'a créé parle un peu de quatre langues et a eu soin de les lui apprendre. Vous pensez bien que l'instrument sous la main de l'inventeur fonctionne admirablement. Mais l'impression produite sur les assistants est-elle toujours très intense.

« Les visites dureraient des journées et des nuits si le maître de Menlo-Park voulait initier ses hôtes à tous les mystères dont il est entouré.

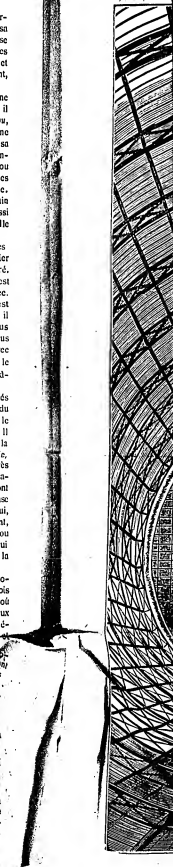
« Lorsque j'ai parlé des hommes de science, c'en a été avec un sentiment de respect et de déférence. De tous les gens éminents avec lesquels j'ai trouvé en rapport, ce sont eux chez lesquels j'ai reconnu les idées les plus élevées, le plus grand désintéressement et la simplicité la plus vraie. Il parle souvent de son entrevue avec William Thompson et se plaît à rappeler que j'avais avait un mauvais chapeau, des habits râpés et n'était pas mieux vêtu que lui.

Enfin le sort arrive. Les visiteurs s'achar-  
nent de leur excursion, reprennent le train ; l'heure  
repose à même pour les pauvres humains, c'est  
à l'Edison ou Edison commence à travailler.  
Soudain, et au milieu du silence profond de  
la campagne, il médite, il s'ennuie, il essuie  
l'inventive. Il prolonge sa veille longtemps après  
que tous ses collaborateurs sont partis. La  
machine à vapeur est arrêtée, les fourneaux sont  
éteints, l'inventeur est seul dans cet immense  
laboratoire, dans ce à ces anciens alchimistes qu'  
dans le mystère des longues nuits, cherchaient  
sans se lasser, la transmutation des métaux  
l'ailleur de longue vie, ou à ces sorciers qui  
préparaient à minuit les philtres amoureux et  
poudre de succession.

« L'aube le surprend parfois creusant un problème, et il n'est jamais moins de deux ou trois heures du matin quand il regagne son *home*. » La petite famille dort paisiblement, les yeux fixés vers les étoiles qu'il examine avec un intérêt passionné, trébuchant contre les cailloux, les mottes, les débris... »

Ouverture de l'exposition internationale  
d'électricité

L'exposition internationale d'électricité a été ouverte le 11 août en présence de M. le Président de la République. Cette cérémonie, empreignons-nous de le dire, n'a été qu'un accomplissement d'une pure formalité. On



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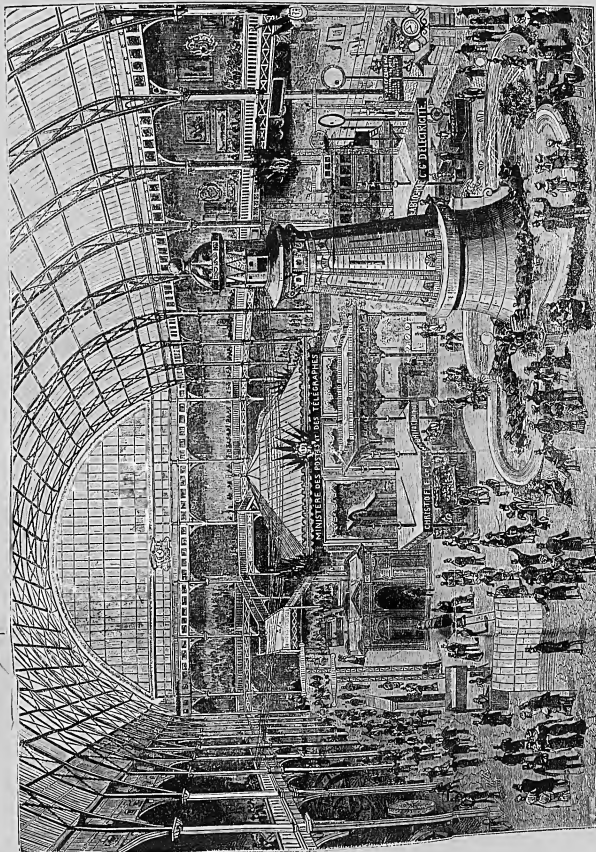
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Paris. Vue d'ensemble de l'Exposition d'Electricité, au Palais de l'Industrie (Voir le plan à la dernière page).

LA

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## ÉDITION FRANÇAISE

*Nous prions les lecteurs qui ne voudraient pas s'abonner, de nous renvoyer le journal sans défaire la bande; dans le cas contraire, nous considérons leur silence comme une marque d'adhésion.*

## EXPOSITION INTERNATIONALE D'ÉLECTRICITÉ

## L'EXPOSITION DE M. EDISON

La gravure que nous publions aujourd'hui représente l'un des salons où sont exposés les appareils de M. Edison, au Palais de l'Industrie. Ses télégraphes, ses téléphones, ses phonographes, ses instruments de précision, ses aimants diviseurs de minerais, etc., tiennent une large place, mais la plus importante est occupée par son système d'éclairage. Le savant américain a pourvu sa lampe d'organes si pratiques, si ingénieusement appropriés à tous usages domestiques, que l'attention publique est vivement suscitée par l'exposition de ce système, dont la prochaine mise en pratique va modifier profondément nos habitudes.

C'est la lampe Edison qui brille dans les lustres de ses salons et sur les brancholes de toutes formes disposés autour des murs. C'est elle que les curieux examinent sur les chandeliers portatifs des trois tables placés au premier plan de notre dessin. Elle donne une lumière douce, fixe, d'une couleur et d'une intensité semblables à celle du gaz. Comme elle brille autour d'un flament de charbon recourbé en U et renfermé dans un globe dans lequel le vide est opéré, elle ne dégage ni odeur, ni fumée, et si peu de chaleur qu'on peut la presser dans sa main sans ressentir aucune sensation brûlante.

M. Edison, au lieu de la pouvoir d'armatures délicates et encombrantes pour amorcer l'électricité à l'intérieur, a simplement formé la partie inférieure du globe par un tampon en plâtre dans lequel deux anneaux en caivre sont scellés. Chacun de ces deux anneaux est soudé à l'un des deux fils de platine de l'intérieur où viennent aboutir les deux extrémités du flament de charbon. Le contact avec le circuit électrique de l'extérieur s'établit par les anneaux. L'un d'eux est pourvu d'un pas de vis, de sorte qu'on peut poser la lampe sur un support quelconque où un pas de vis semblable aura été ménagé.

Cette courte description suffit pour mettre en relief ce qu'est de commode le maniement de la lampe et les combinaisons variées des candélabres, des supports, des chandeliers auxquels elle se prête. On peut voir, dans les salons de M. Edison, des branches pivotantes, en deux ou trois parties semblables à celles commandées employées pour le gaz dans les ateliers ou dans les bureaux.

Les lustres, les appliques où ses lampes resplendissent ainsi, indiquent suffisamment que le temps des bougies et des lampes à huile est passé pour l'éclairage de nos appartements les plus élégants; de même que ces chandeliers seront bientôt dans toutes les demeurs délaissés encore avec pétrole ou avec d'autres sources non moins incommodes et dangereuses.

Ce qui permet à la lampe Edison de se propager ainsi c'est d'abord les avantages que nous venons d'énumérer. Ensuite et surtout, c'est la canalisation merveilleuse dont son illustre inventeur l'a pourvue.

Elle se compose de trois parties: 1<sup>o</sup> la canalisation des rues; 2<sup>o</sup> la canalisation des immeubles; 3<sup>o</sup> la canalisation des appartements. On peut voir sur des tables, à droite et au fond de la salle que nous représentons, des échantillons de canalisation: celle des rues, formée de tuyaux en fer de 5 centimètres de diamètre, remplis d'une matière isolante, traversée par deux conducteurs

en cuivre reliés à la machine dynamo-électrique; les boîtes de jonction, d'où les tuyaux rayonnent en trois ou quatre directions différentes; les formes cintrées qu'elles peuvent prendre.

La canalisation des immeubles a la même forme que celle des rues, avec un diamètre plus petit, puisque elle a moins d'électricité à transporter; celle des maisons est composée de deux filets garnis d'une enveloppe de coton incombustible.

Les conducteurs de toutes ces canalisations sont reliés les uns aux autres par dérivation, dans des boîtes de jonction, dont la grandeur est proportionnée à l'importance de leurs fonctions. M. Edison opère ses jonctions à l'aide d'armatures qui convergent vers les fils une indépendance telle qu'un accident, un écoulement, une rupture peuvent se produire sur un point sans que cela ait aucune conséquence fâcheuse pour les autres parties du système.

Il a intercepté aussi, dans toutes les boîtes, des fils de plomb pour neutraliser les dangers d'incendie; si, par suite d'une trop forte tension électrique, la température des fils devenait trop élevée, le plomb fondrait et le courant serait interrompu.

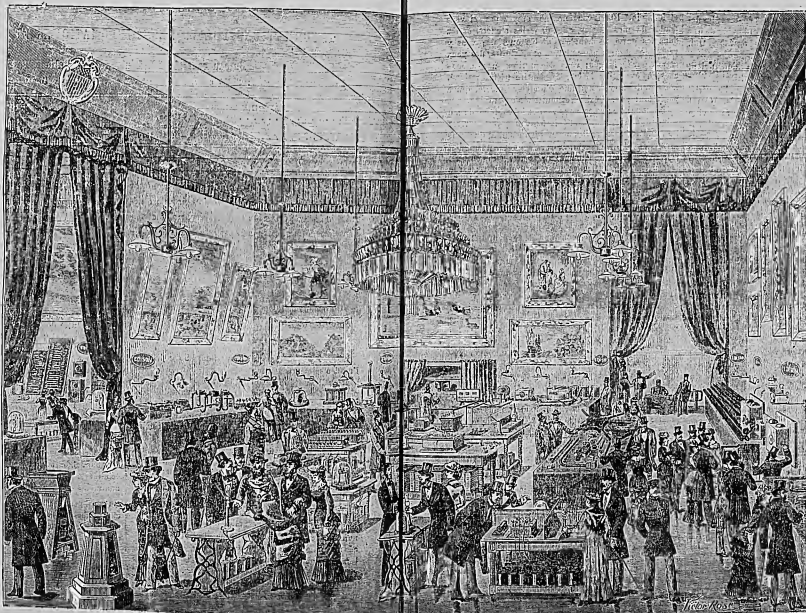
C'est là un accident qui ne peut guère se produire dans le système Edison, car son régulateur

de tension, qu'on peut voir sur une table au milieu de notre dessin, permet de régulariser, suivant les besoins de la consommation, la quantité d'électricité à envoyer dans les conducteurs.

La lumière Edison est livrée au prix du gaz en Amérique, où elle éclaire nombre d'industries et d'habitations. Chaque particulier possède un compteur d'électricité Edison. C'est un instrument fort simple, construit d'après ce principe qu'un courant électrique, traversant une solution métallique, décompose cette solution: la décomposition s'opère en proportion de la durée du courant. Le compteur Edison se compose donc d'un vase plein d'une solution semblable traversée par les fils. Le métal déposé au fond est recueilli à la fin de chaque mois et les dépenses sont calculées en conséquence.

Il est aisé de juger, par ces détails, jusqu'à quel point l'illustre sellaire de Menlo-Park a, ainsi que nous le disions en commençant, pourvu son système d'éclairage d'organes appropriés à toutes ses exigences. Nous ne faisons ici que relever ce qui se dit couramment parmi les visiteurs du Palais de l'Industrie, en désignant le système d'éclairage Edison comme appelé à remplacer très prochainement tous les systèmes en usage.

## VUE GÉNÉRALE DE LA SALLE EDISON À L'EXPOSITION INTERNATIONALE D'ÉLECTRICITÉ



# EXPOSITION INTERNATIONALE D'ÉLECTRICITÉ

Quartier d'Exposition - Secteur 17  
L'ÉCLAIRAGE DES ATTIERS  
D'INDUSTRIE

L'exposition internationale d'électricité au quartier d'Exposition a mis fin à l'existence, pour ce qui concerne l'éclairage, d'un système qui n'avait pas subi aucune modification depuis son invention. Jusqu'ici, les imprimeurs se sont tenus à l'écart de la lumière électrique, préférant la lumière à l'huile, et ce n'est que récemment qu'ils ont commencé à s'intéresser à ce mode d'éclairage.

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L'éclairage électrique, pour se substituer à l'huile, la fumée s'échappe, donnant aux ateliers un aspect complètement différent.

La lampe Edison se compose d'un globe en verre, dans lequel se trouve une spirale de fil de platine, qui est maintenue à l'extrémité par deux vis.

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brûle douce et pure, avec un éclat, une couleur, une intensité semblables à celle du bec de gaz, et une durée qui n'a jamais été atteinte par aucun système d'éclairage.

Cette lampe, dont le prix est de un franc cinquante environ, peut durer huit mois. Elle est très intéressante pour les ateliers d'imprimerie, car elle ne nécessite aucune surveillance.

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ment de charbon assez résistant. Il ent l'idée d'expérimenter du papier carbonisé. Il essaya méthodiquement de tous les papiers possibles ; il en fabriqua même avec des matières spéciales, notamment avec un coton soyeux que l'on récolte dans certaines îles, près de Charleston. Le charbon végétal obtenu avec ce papier est très homogène, et assez rigide. Débrassé comme le platine des gaz contenus dans sa masse, il acquiert de l'élasticité et de la ténacité. Cependant, quand le courant passait, il arrivait souvent que l'éclat de la lumière variait; l'inondation encoeur manquait de fixité.

Des monceaux de bois, du plantes encombrèrent bientôt le laboratoire de Monlo-Park. Les premières expériences firent écarter beaucoup d'essences, et par éliminations successives, on finit par considérer comme parfaite la fibre du bambou. M. Moosé partit pour la Chine avec la mission de rapporter tous les spécimens de bambou qu'on a l'habitude de travailler. Il en fit une collection considérable, et Edison, après de nombreux essais, donna la préférence à une espèce particulière de bambou du Japon. Sa fibre est extrêmement régulière et se découpe facilement. On voit à l'Exposition,

Deux fils de platine destinés à faire, en traversant le courant dans la lampe, sont empilés dans un tube de verre; ils sont électriquement reliés au fil de charbon par deux petits débris obtenus galvaniquement et du section relativement large pour éviter que le courant, en passant, ne les chauffe pas beaucoup; cette disposition empêche aussi les ruptures qui se produisent jusqu'à ce que les points d'attache au charbon et des fils de platine, et les

Pendant que la pompe retire l'air, on fait passer le courant dans les charbons pour les porter à l'incandescence et chasser les gaz qui pourraient rester emprisonnés dans leurs pores. Ces gaz sont enlevés avec un air. Cette opération a pour but, comme nous l'avons dit, de communiquer une résistance, une solidité et une homogénéité

sa, on peut par conséquent disposer  
ampe par son gros bout ou par sa  
nante; peu importe; elle est hermétique-  
ment close et par conséquent peut brûler  
sur l'eau, dans des atmosphères viciées,  
les mines à grisou, etc. La quantité  
de lumière engendrée dépend du courant  
du fil de charbon; il y a avantage à ne  
pas augmenter outre mesure l'incandes-  
cence du fil; on peut lui donner un éclat  
éblouissant, mais l'œil est blessé et la

...distribution à domicile, etc., —  
pro-  
complexe s'il en fut jamais. Nous  
dans un prochain article par quel-  
M. Edison est parvenu au but,  
ment cette fois encore il a réalisé ses  
sais, et fait passer ce qui hier encore  
été qualifié de rêverie, dans le do-  
me des réalités !

HENRI DE PARTVILLE.

**EXPOSITION "D'ÉLECTRICITÉ"**

VIII. *Problems in front*

## ÉCLAIRAGE ÉLECTRIQUE

Système Edison, 65 2 2 7 37

Nous avons défilé la lampe de M<sup>r</sup> Edison. Une lampe, et exultante qu'elle n'est pas une catholiste pas à elle seule un système complet d'éclairage ; ce n'est qu'un rouage essentiel dans l'ensemble. On ne peut pas se contenter d'une seule lampe, on a besoin de tout l'huile. La production économique de l'électricité exigeant des machines énormes, il est évident que pour faire fonctionner le nouvel éclairage dans les maisons, il faut d'abord construire des usines à produire commodément et d'obliger les consommateurs électriques à venir d'eux-mêmes dans les lampes, comme on ce moment même arrive jusqu'à nos M<sup>r</sup> Edison à se contenter de problème, et nous allons leur expliquer aisément comment il faut fabriquer l'électricité par grandes quantités, la canaliser et la distribuer à domicile. On ne peut pas répéter que nous sommes dérivés par la nature, car nous sommes projet plus ou moins sujet à extinction, mais bien un système exécuté et prêt à

dommages. On trouve tous les appareils électriques, prêts à être posés, dans la salle Esso, au Palais des Champs-Élysées.

Lorsqu'il s'agit du gaz, qu'il conviendrait toujours de prendre pour modèle, parce qu'il n'a pour lui l'expérience acquise, on trouve le pétrole. Le pétrole, à dessein, n'est en plusieurs endroits dans chaque ville. De même, l'électricité est partout recueillie à une ou plusieurs fabriques d'électricité, évitant l'importance du pétrole à décliner. Le gaz s'en va sous terre dans les gros tuyaux qui suivent les câbles électriques. On a le premier réseau, on grille des tuyaux de moindre diamètre qui longent les rues transversales et enfin sur chacun d'eux on branche des tuyaux encore plus petits qui donnent accès au gaz dans chaque maison. On a une organisation qui a été assez appropriée au transport et à la distribution de l'électricité.

De chaque usine centrale partent des conduites matrières qui font rayonner dans toutes les rues des conduites secondaires, sur lesquelles se greffent à leur tour les conducteurs de petite section qui pénètrent dans les maisons et se conduisent à domicile. En apparence, ces conduites ont pour la conduite de leur diamètre est extrêmement réduit, les pertes d'eau ne dépassent pas le diamètre d'un crayon. Ce sont aussi des tuyaux, mais des tuyaux qui n'ont rien d'oreux, renferment deux liges de cuivre pur d'un diamètre de 12 millimètres, c'est-à-dire plates d'un côté, lisses de l'autre; si l'on veut, une lige d'acier au carbone recouverte par le milieu d'un tube d'acier au carbone de vingt-cinq millimètres qui se prolonge dans la canalisation sous émaillée dans une masse d'isolant de composition spéciale; il faut remplacer la gaine par la conduite

travaux maritimes d'interpellation de cette nature, les deux ministres ont été surpris par un voyage d'affaires au port d'Amsterdam, où ils ont dû se rendre à la suite d'un différend relatif à la pêche de la morue. Les deux ministres ont été surpris par un voyage d'affaires au port d'Amsterdam, où ils ont dû se rendre à la suite d'un différend relatif à la pêche de la morue. Les deux ministres ont été surpris par un voyage d'affaires au port d'Amsterdam, où ils ont dû se rendre à la suite d'un différend relatif à la pêche de la morue.

[illegible][illegible][illegible]

(2) On a relié chaque barre à celle qui lui répond du côté opposé du cylindre-brevette des rondelles pour diminuer la résistance de la section des disques étant plus grande que la section de la barre, la résistance totale est diminuée de ce chef.

mercaderie de New-York, est le seul des Sud-, qui fait face au port. Ce grand quadrilatère a environ un kilomètre carré. Vers le centre du quartier se trouve l'établissement central. On doit y grouper 12 chaudières à vapeur et 12 machines dynamo-électriques avec leurs moteurs, soit au total environ 1,000 chevaux. Tout ce matériel ne fonctionnera qu'au fur et à mesure des besoins; on

Nous avons vu engendrer l'électricité et nous savons comment on la conduit dans les maisons. Il se présente immédiatement une difficulté. L'usine est en pleine production, le courant circule et allume les lampes d'un quartier. Il se fait tard on vient d'éteindre coup sur coup, 100, 500, 1.000 lampes; naturellement celles qui restent bénéficient de l'excès d'élec-

...M. Edison a combiné pour ce principe un régulateur très pratique, il a groupé sur une table toute une collection de bobines de résistance convenablement graduées et répondant aux variations possible d'intensité dans la canalisation. Sur la même table se trouve une manivelle qui peut tourner sur un cercle gradué.

L'opérateur ne peut, du reste, s'y tromper. Il a sous la main, tout près du révélateur, un appareil révélateur des changements d'intensité du courant de la canalisation. C'est un galvanomètre à miroir qui projette sur une règle horizontale, un point lumineux, réfléchi par une lunette.

On voit à l'avis de la carte que l'angle  $\alpha$  est le complément de l'angle  $\beta$  qui obéit ainsi par une seule lecture à la différence d'intensité de la lumière et de la lumière de la lampe. En effet, lorsque les deux taches ne perçoivent plus, c'est qu'elles sont égales. On a donc  $\alpha = \beta$ . On peut donc mesurer sur la lumière réfléchie se combinant avec la lumière réfléchissante par le pourcentage de la carte. Il faut rapprocher la carte d'autant plus près de la lampe que la tache est plus affaiblie. Comme les taches sont de tailles différentes, il est nécessaire de raisonner sur le carré de distance, on adduit d'avance les intensités respectives pour chaque distance. On choisit la tache et la graduation marquée sur la règle évite les calculs.











EXPOSITION INTERNATIONALE D'ÉLECTRICITÉ  
CHAUDIÈRES & MACHINES A VAPEUR

(Suite)

En dehors des chaudières De Naeyer et de quelques chaudières de locomobiles qui n'offrent rien de particulier, nous ne trouvons en fonction à l'Exposition d'électricité qu'une chaudière Collet, variante peu intéressante des chaudières du type tubulaire général auquel appartiennent les chaudières Belleville, Ruel, De Naeyer, etc. Nous devons citer aussi la chaudière de MM. Babcock et Wilcox, qui doit activer la puissante machine dynamo-électrique d'Edison; mais nous croyons devoir attendre, avant de nous en occuper, que cette intéressante installation soit en fonction; nous en ferons l'objet d'une étude spéciale.

Il nous reste à passer en revue les différentes machines motrices qui donnent la vie et la lumière à cette belle Exposition d'électricité.

**Machines Compound type Sulzer, de MM. CARELS frères, de Gand.** — En tête se présente une machine belge : la machine Compound à soupapes du type Sulzer, exposée par MM. Carels frères, de Gand. Cette machine se compose de deux machines horizontales séparées attaquant le même arbre moteur à l'aide de leurs manivelles enclées à angle droit sur cet arbre. Les cylindres de ces machines ont l'un 450<sup>mm</sup> de diamètre, 900<sup>mm</sup> de course, l'autre 700<sup>mm</sup> de diamètre et 900<sup>mm</sup> de course. La vitesse de marche est de 65 tours par minute.

Les deux cylindres sont à enveloppe de vapeur. Le petit cylindre du type ordinaire de MM. Sulzer, de Winterthur, est à détente réglée par le régulateur, la vapeur d'échappement se rend dans un réservoir tubulaire intermédiaire, où elle est réchauffée par de la vapeur venant directement des chaudières; de là elle passe dans le grand cylindre au bout duquel se trouve le condenseur commandé par le prolongement de la tige du piston.

Tout est ensemble à ce caractère de parfaite élégance qui distingue les machines Sulzer et d'admirable fini qui caractérise les bons constructeurs gantois.

La marche ne laisse rien à désirer; malgré la haute pression (7 atmosphères) et la grande vitesse de rotation, on n'entend d'autre bruit que celui des dé clics. Les diagrammes sont remarquables : la compression dans le petit cylindre ramène la pression dans l'espace nuisible, au point de départ de la course, exactement à la pression dans la chaudière.

Les proportions du réservoir intermédiaire sont telles que la ligne d'échappement du petit cylindre est à peu près parallèle à la ligne atmosphérique.

Des expériences faites à l'Exposition montrent que la consommation de vapeur est de 7,3 par cheval indiqué et par heure, sans aucune déduction pour la condensation considérable qui se fait dans de longues conduites et dans les enveloppes. C'est certainement un des plus beaux

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4<sup>e</sup> ANNÉE. — N° 2.

BRUXELLES ET PARIS

13 Octobre 1893.

L'Ingénieur-Conseil paraît deux fois par mois. Il contient plusieurs articles originaux concernant les chaudières à vapeur et leurs accessoires, les machines à vapeur et leurs applications diverses, notamment aux tramways, les transmissions de mouvement, les installations de conduites d'eau, de vapeur et d'air, les machines et matières employées dans diverses industries, spécialement dans l'industrie mécanique, le travail du bois et l'industrie lainière, les applications de l'électricité, etc.

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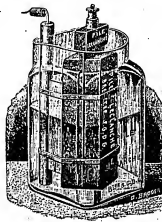
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# NOTICE

ET LA

## LAMPE-SOLEIL

et les avantages de ce mode d'éclairage

### 1° Facilité et économie.

La Lampe-Soleil est une lampe électrique à arc voltaïque, dont l'appareil les points lumineux des crayons de charbon sont isolés, ceux-ci étant noyés dans la matière réfractaire. Elle n'allume que la partie centrale, la plus résistante et par conséquent la plus économe, de l'arc voltaïque, laquelle produit une incandescence extraordinaire de la matière réfractaire. C'est cette incandescence qui donne la lumière chaude et douce qui caractérise la Lampe-Soleil.

D'un autre côté, l'arc voltaïque, essentiellement variable par nature, étant guidé par deux orifices et noyé dans l'incandescence de la matière réfractaire, la lumière produite est d'une *forte* *et* *constante* *et* *ne* *peut* *pas* *être* *de* *faible*.

Tous les journaux scientifiques et autres ont reconnu ces qualités spéciales de la Lampe-Soleil, ainsi que la nouveauté et la simplicité du procédé employé par M<sup>rs</sup>. Clerc et Bureau.

La coloration chaude et douce a pour avantage de rendre la lumière plus agréable et plus hygiénique pour la vue, que les rayons bleus fatigants et purpurins; enfin elle la rend ennoblement propre à l'éclairage des salons, des cafés et de tous les endroits de plaisir, sans lui ôter aucune de ses qualités au point de vue de l'éclairage industriel.

### 2° Faculté de faire varier la lumière et de l'envoyer à de longues distances.

La Lampe-Soleil, malgré la longueur de l'arc voltaïque qu'elle emploie, ne nécessite que des courants électriques d'une intensité très faible. Cette particularité, qui, au premier moment, fait dire aux spécialistes que la Lampe-Soleil exigeait des arcs longs, n'est par elle-même ni pratique ni scientifique et doit nécessiter une dépense considérable de force motrice, prévient ce que l'arc étant enveloppé dans la matière réfractaire parée au rouge éblouissant, celle-ci jette, comme au chalumeau, une lumière considérablement plus résistante, facile à produire et permet d'employer des courants de faible intensité. D'un autre côté, la même matière réfractaire, en recevant les crayons de charbon, constitue pour leurs points une sorte de cornue où la transformation en graphite s'opère, ce qui facilite encore la formation de l'arc et rend possible, avec une faible intensité de courant, une arc si long qu'on ne peut produire dans l'époque qu'il a été de cou-

rance intense et d'une action considérable, et qui, l'apparition de la Lampe-Soleil, ont effrayé les électriciens. C'est tellement vrai qu'on peut supprimer le courant pendant trois semaines dans une Lampe-Soleil ayant un arc de 40 millimètres, et faire jaillir cet arc en envoyant du nouveau le courant dans la lampe.

La faible quantité de courant nécessaire pour alimenter la Lampe permet de produire la lumière à de grandes distances du générateur de l'électricité, et, par suite, d'éclairer des vastes étendues d'eau la lumière sans essayer à terre, une ville ou à de grandes guerriers. De là, diminution énorme dans le coût de la force motrice et dans les frais généraux.

Des expériences nombreuses, faites à l'instigation de la Compagnie, ont démontré qu'un besoin on peut aller jusqu'à 10 kilomètres des générateurs d'électricité.

La Lampe-Soleil pourra délivrer tous les endroits publics ou une certaine quantité de lumière ou nécessaire, comme les salons, les cafés, les grands magasins, etc., d'un prix égal ou inférieur au gaz, tout en donnant une intensité lumineuse triple, quadruple et, dans certains cas, dix fois, par exemple, double, de celle qu'elle est susceptible de produire.

D'un autre côté, si la Lampe-Soleil ne nécessite que peu de quantité de courant, elle supporte parfaitement les courants intenses et donne une lumière qui tout est proportionnelle.

Sous ce rapport elle est aussi élastique que possible, et, sans y toucher, on peut la faire varier de 30 à 4,000 ampères, suivant la force du courant et les résistances qu'on y interpose. Il suffit de spécifier quels avantages résultent de cette élasticité de l'appareil pour la distribution de la lumière par de grandes usines centrales, notamment pour les jeux de scène dans les théâtres.

### 3° Simplicité de l'appareil et perfectionnement et apparence.

L'appareil même qui constitue la Lampe-Soleil consiste en un bloc gros comme le poing d'un enfant, composé de petits cailloux de pierre blanche et de cailloux, dans lequel glissent, par leur propre poids, les deux crayons taillés dans du charbon de cornue ou moisis en charbon artificiel. Ces crayons peuvent être de diverses grandeurs, homogènes ou non dans toute leur masse, il n'y a rien à la lumière reste égale et fixe.

Les premiers électriciens qui ont vu la Lampe ont dit que c'était un bréviaire grossier. C'est le plus bel éloges qu'ils pouvaient en faire. Depuis sa première apparition, les électriciens, les études faites par la Compagnie de la Lampe-Soleil ont amené un grand progrès au point de vue pratique et économique. On est arrivé à produire artificiellement des tubes moisis en matière réfractaire dont la lumière est beaucoup plus longue que celle des tubes de pierre et de machine primitivement employés, et qui, surprennent, par la régularité de leur fabrication, les causes nombreuses d'extinction qui auparavant provenaient de l'ajustement irrégulier des matériaux primitifs.

De plus, on est parvenu à enlever complètement la Lampe dans des lampes, qui peuvent être aussi lumineuses qu'on le voudra. Ainsi, enroulée, la Lampe est absolument silencieuse, comme tout le monde peut le constater.

# LA Correspondencia de Paris

ILUSTRADA

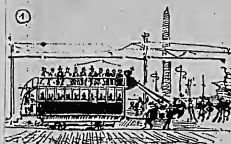


TOMAS ALVA EDISON

LA CORRESPONDENCIA DE PARIS

## VIAGE CÓMICO

A LA  
Exposición Internacional de Electricidad.



1.º El tranvía de la Exposición. — 2.º Un día de entrada libre. — 3.º Un día de salida de pago. — 4.º La Sala de Telegrafía. — 5.º Un Comedor caluroso. — 6.º El Palacio del alumbrado eléctrico.

## L'Italia

all'Esposizione d'elettricità

L'Italia non dovesse presentarsi in questo momento tanto ricca di gloriose passato, quanto povera nelle applicazioni scientifiche del presente. Infatti, la esposizione storica fiorentina, ricca degli apparecchi riguardanti i tentativi dell'Accademio del Cimento e del Galileo, e degli apparecchi concernenti gli studi e le investigazioni del Volta, dei Galvani, dei Montanucci, dei Nobili, dei Marziani e di tanti altri illustri uomini, che portarono un largo contributo al progresso dell'astronomia, l'esposizione storica destò l'ammirazione ed il più vivo interesse degli studiosi e del pubblico che si affollava a venerare le preziose reliquie.

Non così l'epidemiologia moderna che poteva senza interesse; ma a poco per volta si fa strada la voce che cala in questa vi fosse del buono, che talora invasionalo loro degno di nota; e che non fruttasse soltanto un'illusione. E' vero che le malattie che nei programmi moderni delle applicazioni elettriche, il Pacinotti, nativo di Pisa e modesto professore a Cagliari, gli viene ancora, fin dal 1890, aveva fondato un'istituzione che aveva per scopo di controllare la malattia e di studiare le sue cause. E' vero che il suo nome. Come si può intendere la cosa ha fatto futuro e destinato gran rumore fra gli scienziati; la lotta si è impegnata naturalmente nel giro. I giornali italiani, sostenuti validamente dagli inglesi, dal tedesco, dal francese, dal russo, hanno fatto la conoscenza al Pacinotti di un diploma d'onore; ma la loro proposta è stata combattuta da alcuni francesi, ai quali pareva di veder conferita una così alta ricompensa ad un vittorioso competitor del Gramme; e per loro giudizio al Pacinotti non si poteva domo essere concesso una medaglia d'oro.

Al di là, maggioranza fa un favore del Pci, o coarctano, — gli danno del bel morte del vero, — a formarla anche buon numero di frasci raggozzoli ad ogni. Così il Pci, o coarctano, — gli danno la ricompensa, cioè il diploma d'onore, — non gli dà una medaglia d'oro, come ne loro corsa la voce. Un diploma d'onore è stato pure conferito all'onore delle corti, — valori in Torino ed all'istituto tipografico di Milano di Firenze per bellissimi favori in gallopiantia. Agitatissimi di fascia di Bologna, di Pavia, di Napoli, di Padova, di Torino, di Genova e di Mosca, al nostro Braccio di Milano, che presso poter all'Esposizione retrospettiva, sono stati destinati parti-

colori (tutti di ringraziamento. Dopprima erano stati conferiti dei diplomi d'onore ad alcuni fra i detti istituti, ma poscia, essendosi osservato che il numero era troppo grande, e che ciò poteva dar luogo a delle gelosie di nazionalità, li giurì escluso tutti gli istituti del diploma e decretò delle semplici lettere. Agli espositori italiani sono state conferite parecchie medaglie d'argento e parecchie altre di bronzo.

**Diploma d'onore:** Ministero di agricoltura, industria e commercio; Ministero dell'istruzione pubblica; Stabilimento governativo per la fabbricazione delle carte-valori; Istituto reale topografico militare; professore Padonati, di Coglieri, il primo inventore della macchina mogano-elettrica che poi prese il nome da Grammo.

*Diploma di cooperazione:* Istituto dello scolaro e lettere di Milano; Museo di Firenze; Università di Genova, Modena, Napoli, Padova, Pavia, Pisa, Torino; liceo Spallanzani di Modena, liceo Volta di Como, liceo Volta di Verona.

*Medaglia d'oro:* Gelfarelli.  
*Medaglia d'argento:* Cardorelli, Ceradiali,  
Glaori, Pierucci, colonnello Recagal, E. A.  
Guglielmini, Richard.  
*Medaglia di bronzo:* Baadlori, Covignano,  
Pantlori, Coross, Mugna, Nigro, Sorra-  
vallo, Sommoti, Di Nembello.

N° 29.

25 CENTIMES LE NUMÉRO

Dimanche 4 Septembre 1885

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THOMAS ALVA EDISON













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**EXPOSITION  
INTERNATIONALE D'ÉLECTRICITÉ A PARIS**



















By a Special Correspondent.

Paris, September 2.

Although every exertion has been made to complicate the arrangement for the exhibition of the various systems of electric lighting within the limited period required, it cannot be said that the apparatus is just in full operation; but there is such an abundance of light both within and without the exhibition walls, from the lamps now in nightly use, that the eye is bewildered and the imagination loses to wander. One passes from the dark hall through room after room under a constant stream of light, varying in intensity with the power and character of the particular lamp employed, but in almost every case there is ample illustration of the unboundedness of electricity for illuminating purposes. Stripping through this vastation may be deemed—for the present observer will maintain that it is erroneous—but it is no more than express up what is said of matters. In every sense of the word the exhibition is attractive, and that it will not be without important results in developing the scientific lighting of streets or large open spaces goes without saying; but that it provides the substitution of electricity for gas, as less than really asserted, does not alone well illustrate.

The present exhibitions may contribute somewhat toward the solution of this intricate problem, but the construction is similar, and not greatly different in its intrinsic principle, so that the lighting manifested, now for six nights ago, (except of course here would themselves of the facilities for judging of the advantages and disadvantages of electric lighting. Everything has been done in the interior of the building to make the exhibition as attractive as it possibly can be, and there is a monstrous failure, if such an expression may be used, in the out crowd, which always grumbles Parisian. Standing at one point of the gallery which surrounds the immense hall, the visitor cannot fail to be carried away in amazement to those spheres, suspended up by slender tulle, where wonders were performed at the building of the magician, or when the scene appeared in accordance with the extravagant fancy of the fortune teller of the charmed ring—in a word, he realizes where nature is made subservient to art or to an unhappy poet. But the onset of hearing in this case is apt to break the spell. The hissing of escaping steam, and the constant whir and noise of machinery are heard, illustrating the practical element, and give rise to novelties of another description. The gas and steam engines, from 1 to 100 horse power, occupy the entire side of the immense hall. The workmanship of the engines and their capacities are of superior character, and some of them, being specially designed to rotate dynamo-electric machines, have important details introduced to give that steadiness of action which is so greatly desiderated in electric lighting. Indeed, the motive power is quite as varied as the lamps which illuminate the main hall and rooms.

Quite a host of electricians have entered the field with lamps for which some special advantage is claimed, but it is no difficult task, to select those which are most likely to meet with general favor. It is no duty of the writer to make this selection. With them all there prevails, to a greater or less extent, the objectionable flicker, and the multiplication of the niches here which are so perplexing to the visitor as they are to the spectator. One lamp shown by the Belgian Electric Lighting Company, named the "lamps sold," is a notable exception in this respect, that it gives forth a brilliant, pure light, and is less subject to irritating later rupture. The lamp is smaller than almost any of the others exhibited for street lighting purposes, but the light is intense.

The French light, which has obtained a certain amount of success in London and elsewhere, merits a position here, and is high in the average of steadiness. The "Maison" light is also prominent. The rays of the light emitted by it is good and equal, but it does not—perhaps on account of the globes employed—give forth the brilliant light of the Belgian lamp. As indicated in the notice last written, Mr. Moreau's exhibitors system of volans are lighting by two large burners within, one placed in the front of the building. Experiments are nightly made with these lamps, and the effects produced are satisfactory. The lamps are so arranged that the rays of light "in the transmitted in a straight direction through the eye, or, consequently, a part of the open space in front of the Exhibition." "You see that," says the urban humorist of the town in the "Lamp," "the rays of the light of the sun light, or is directed to the eye of the observer." The exhibition of the light effects presented can be seen in the direction of the light which light effects presented can be seen, the observer could see that, at the focus, the rays are so arranged that they travel outward they spread out in a cone, a powerful light must be of great use.

But turning from these to examine the smaller light inside the building, one can see to every illumination for domestic purposes. In a place two or three years. Then and Edison are the most practical competitors for their opinion the greater part of the attention of the exhibition. This position was claimed for it, it was the first in the field, and it was the most successful. The lamps are attached to a highly ornamental pendant, and the effect produced by the multiplication of these lamps is exceedingly pleasing. Indeed, on entering the room the first impression produced is one. The light is soft and agreeable, but when one first looks at the lamps themselves, he is very forcibly reminded of the tale of "The Miserable Laborer."

The French light, which varies somewhat from that of Edison, is also greatly admired, but like every other system of electric lighting it is subject to the same objection. During one of the visits of the writer, a restaurateur in the table display, suddenly found himself in the dark, and although the lights were quickly on the spot, it was some time before the lights were again on the spot.

Foundation from journal  
des Eclairages, 8, 1881.  
The International Electric Exposition

We shall soon begin to study thoroughly the discoveries in the field of electricity as exhibited in the Palais de l'Industrie, but will not delay in speaking of the marvellous applications of electricity to the illumination of our dwellings of far-reaching with the marvellous lamps whose action, so complete, is due to the illustrations painted of Niche Park. His name is inscribed on a placard over the door of Salon 24 "Edison". On visiting his exhibition and observing the various and numerous products of his genius the words of Bacon are recalled to our mind "In quibus a new invention to this world seems truly to be the finest act a man may perform. Every new invention may become a book to mankind, whilst the works of philosophers only benefit individuals of some countries. The duration of the latter is of but a few centuries—that of the former is eternal. Inventions benefit all without causing fear or damage to any."

If there is a man in the world who must think that it is a certainty that of the American continent, for it alone presents in all its parts that admirable characteristic of completeness, and enables us immediately to make a great progress to the advantage of all.

Other marvellous lamps, ingeniously constructed and exposed in the Salons adjoining Edison's, but none of them give that soft and pure light and steady character, nor are they attached to any really practical system of installation.

Edison's and in the interest of truth, progress and

Translation from Journal  
des Etats, Sept. 8, 1881.  
The International Electric Exposition

We shall soon begin to study thoroughly the discoveries in the field of electricity as exhibited in the Palace de l'Industrie, but will not delay in speaking of the marvellous application of electricity to the illumination of our dwellings of facts realized with the incandescent lamps whose action, so complete, is due to the illustrious scientist of Menlo Park.

His name is inscribed on a placard over the door of salon 24 "Edison". On visiting his exhibition and observing the various and numerous products of his genius the words of Bacon are recalled to our mind "in giving a new invention to the world seems truly to be the finest act a man may perform". Every new invention may become a boon to mankind, whilst the works of politicians only benefit individuals of some countries. The duration of the latter is of but a few centuries, that of the former is eternal. Inventions benefit all without causing pain or damage to any.

If there is an invention which unites these words, it is, certainly, that of the American scientist, for it alone presents in all its parts that admirable characteristic of completeness, and enables us immediately to realize a great progress to the advantage of all.

Other incandescent lamps ingeniously constructed are exposed in the salons adjoining Edison's, but none of them give that soft and pure light and steady glow, nor are they attached to any really practical system of installation.

Let it be said in the interest of truth, progress and

the incandescent lamp the most favorable impression produced is that it is lighted by pure gas burned under the most favorable circumstances. The light is soft and agreeable; but when one first looks at the lamp and then turns to the machinery employed to keep the homogeneous carbons incandescent, he is very forcibly reminded of the fable of "The Mountain in Labor."

The gas light, which varies somewhat from that of Edison, is also greatly admired, but like every other system of electric lighting it is subject to instant extinction. During one of the visits of the visitor, a reinforcement to instant extinction. During one of the visits of the visitor, a reinforcement to instant extinction. During one of the visits of the visitor, a reinforcement to instant extinction.

Looking at the effect produced by these representative systems, it might fairly enough be stated that, in the hands of a good engineer, this room could be lighted up quite as efficiently with gas, and at a moiety of the expense.

It is impossible in the space at command to go into details on this, or any of the other points which have been taken up. All that one can say is to indicate general impressions, and those after repeated visits to the exhibition tend in this direction, that gaslight has nothing to fear from the introduction of the electric light, either for domestic or other purposes.

Translation from Journal  
des Électriciens, Sept. 8, 1887.  
The International Electric Exposition

We shall soon begin to study thoroughly the discoveries in the field of electricity as exhibited in the Palais de l'Industrie, but with not delay in speaking of the marvellous applications of electricity to the illumination of our dwellings of facts realized with the incandescent lamps whose action, so complete, is due to the illustrious Scientist of Menlo Park.

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Other incandescent lamps ingeniously constructed are exposed in the salons adjoining Edison's, but none of them give that soft and pure light and steady flame, nor are they attached to any really practical system of installation.

Let it be said in the interest of truth, progress and

and general welfare, that Edison's system constitutes a complete revolution in domestic illumination, and he will very shortly be called upon to supplant all other systems in use.

This opinion may at first seem as exaggerated to those who have not examined Edison's illuminating apparatus.

We are apt naturally to distrust new things, our excellent precaution, which we in France carry perhaps to excess, but when the evidence of facts are so convincing it is but just to recognize it. It is even a pleasure to a sensible man to do so, especially when the way has already been pointed out to him by those whose science and competence in matters submitted to their judgment have never been questioned.

Such is the case with Mr Edison; an interesting case as ever repeated. Our readers will recollect the furor raised among scientific men of France by the news of the discovery of his system of illumination. It first caused enthusiasm soon modified by the criticism of competent scientists, and particularly, M du Moncel, the eminent electrician manifested an opposition to Edison's system in an article that caused a great sensation among the most celebrated electricians and denied its practicability. To be sure, an ocean lay between this laboratory of the hermit of Menlo Park and the study of M du Moncel; but since Edison's system has crossed the sea, M du Moncel has changed his opinion, for, in a letter which has been published, he welcomes the new arrival after enumerating the experiments with other incandescent lamps in these words:

"All these experiments achieved but moderate success to say no more, and when in 1879 the new Edison incandescent carbon lamp was



was annoyed many of the scientists, and I particularly, doubted the accuracy of the reports which came from America. This invention of carbonized paper seemed incapable to resist mechanical shocks and to maintain an incandescence for any considerable length of time. Nevertheless Mr Edison was not discouraged, and despite the active opposition made to his lamp; despite the polemical acerbity of which he was the object, he did not cease to perfect it in a practical view, and he succeeded in producing the lamps which now sell at a profit, at the Exposition and are admired by all for their perfect standing.

There are declarations which certainly cannot be suspected and which do honor at the same time to their authors and to him who is the subject of them.

We have before us a letter from an important Lithographic house of New York who have used Edison's system of light during the past year. They know what difficulties they had to contend with whilst using gas, above all in the application of numerous colors in lithography. The clear delicate shade changing easily under the glimmer of oil or gas lamps; and a workman must be familiar with the light of his shop to enable him to avoid mistakes. These inconveniences have disappeared since gas has been supplanted by Edison's electric light. There is the expressed result of the superintendent of the printing works on the electric light.

"We have presented our work with more certainty when shade and the different colors in copy are concerned. The workman operates with as much facility as in full daylight. We have the necessary motive power to light 100 Edison lamps which are equivalent to 100 gas burners. The light has not been extinguished nor the work interrupted in a moment during the year. The Engineer who directs the

machines of our factory applies the light to the lamps from our motive power at no sacrifice to our regular work, since this is not altered and the Edison light costs less than that of gas."

The electric light is already employed in various industries. In addition, it is being introduced in New York with astonishing rapidity as a domestic light. It penetrates not only where gas exists but where it never was before, that is to say, in elegant apartments, in the saloons where it replaces the bustles, the chandeliers and the ancient candles.

After a while we shall recall the inconveniences of them as we recall the joys of our diligences, formerly, the badly made candle melted and dripping upon dresses and faces, the chandelier rings broken and falling on the shoulders of dancers, the cry of fire to which the burning of the bed curtains gave rise and the nauseous odor of the wax candle and a smoking wick. None of these with the Edison light. It burns safely and pure, enclosed in its globe and produces a little heat that the most delicate hand can hold it without fear of being burnt.

Thus we say that the Edison system is on the road to produce a complete revolution in our habits we only draw a conclusion from a series of observations, and this conclusion is more strongly confirmed when we compare the light of gas to that of the incandescent light of the American scientist.

M. Siemens in a lecture lately delivered before some engineers upon the gas in use at London expressed the opinion that in consequence of the application of electric lighting that gas yielding 90 per cent of heat and only 10 per cent of illuminating power is destined to become the natural agent of heat. He absolutely shows this opinion. We will follow the destiny of all terrestrial things.

which encounter another better organization. It will be vanquished. It is the destiny of the weak: it is the eternal law of combat for existence, where, the development of which is equally fatal in the economical phenomena as in the phenomena of life.

On one side the system of Edison with his lamp; on the other gas and its analogous products will develop: themselves in the sphere better adapted to their nature. Fuel in heat, gas may be usefully employed in the production of steam for limited power.

Thus the peaceful revolution introduced by Edison's system will procure benefits not only in a direct and immediate shape in relieving the manual labor of workmen, where the industry will not admit the use of steam and who will find that gas will assume its true sphere as an economical auxiliary.

If the record is reliable, it says that gas light was discovered by Lebon in 1786 and was applied for the first time in 1817 at Paris in the Passage des Panoramas by an English company.

The discovery of Edison in 1879 will, we have good reason to believe require less time to become popular.

A French company is formed and we may hope they will push their works so rapidly that before the end of the year the Edison system will not only be operated in the Passage des Panoramas but also in a great number of our dwellings.

## The Exhibition of J. A. Edison

On leaving the hall of Congress the eyes are struck by a movement of belts and pulleys.

One finds himself in the center of Edison's system. It is from this point that the operator controls and distributes his light and power. A switch is turned; in an instant the hall is plunged into darkness and but one simple light burns. This unique light is extinguished in its <sup>turn</sup> and instantly relighted.

Another object is touched, suddenly and <sup>the</sup> entire wall is resplendent with fire.

This same takes place with the second and with the third. The candleburn project a brilliant flash which is repeated every ten times in a minute.

Such is the manner in which Mr. Edison has <sup>entirely</sup> furnished us the means to set in motion by electricity all the instruments destined for domestic use, the tools of our workshops. <sup>the</sup> Mills to be turned, no more fatigue of body and spirit for the workmen of our industrial towns. Edison has conceived multiple forms of applications for our use.

One machine of the power of one man or of 1 to 5 horses as you will can be used in your dwellings without any danger to health and by whose action no fatigue results to your limbs. It requires no attendance and no personal energy to aid the machine but works by itself. We can use as much power as we require without the necessity of paying for more than we need.

At night the great electric light bearing the name of Edison is started and one cannot fail to admire it in all its splendor.

The incandescence is produced by a common piece of charcoal and assuredly promises the most surprising results. We can henceforth hold in our hands an electric chandelier of 16 arms. Marvellous thing: it is possible to burn this amazing light, under water nor can it be extinguished by a block of ice.

There is no flickering, no fatigue to the eyes. It produces no disagreeable odor nor noise.

It is a pure simple gold tinted light.

With what purity this delicious light sets off the colors of the fine tableaux which ornament the first salon of Edison's tableaux, the finest ornament of which is from the salon of Messieurs Arnold & Srip, whose value is estimated at \$250,000.

With what perfection it exhibits the tints so pure, so fresh the artistic colors which are exposed against the walls and which imitate with perfect fidelity the marvellous Gobelin tapestry and other most celebrated fabrics

The two salons of Edison's are in themselves a complete and unique exhibition. The quadruplex telegraph one of the glories of this celebrated inventor a system which permits many despatches to be sent through one single and the same wire and these despatches can be crossed in different directions; the carbon telephone of Edison actually in use in every country and which is accompanied by models of every form of this instrument from the first experiment to the compact carbon transmitter employed to reproduce the sounds of the human voice: all these apparatus are exposed in a historian's collection which shows to what point the subject has been studied by Mr Edison.

Mr Edison was the first to avail himself of this particular property of carbon to vary the resistance of telegraphic circuits and before any other person had approached this question, he had already <sup>been</sup> employed in the construction of a great variety of scientific <sup>practical</sup> instruments among which are found the Microtasmeter, the telegraphic relay and the Carbon Rheostat.

One may see many forms of Magneto-telephones constructed by Mr Edison much before this inventor had made his first essay of the speaking telephone.

Here is the Phonograph which registers the human voice <sup>divers</sup> ~~these~~ reproduced and which by altogether new ~~dispositions~~ <sup>devices</sup> which Mr Edison seems only to preserve the sent, transmitted moreover at a distance by means of the telephone. Further on is the Electric pen which permits of the reproduction of a letter,

designs and a considerable number of copies taken from them.

Next comes the Electro-motograph of Edison the best invention perhaps of this incomparable inventor, an astonishing apparatus by which <sup>words</sup> may be transmitted to a distance as in the telephone but in reproducing it with its natural intensity.

The Electro-motograph consists of a cylinder of chalk, of hydrate of potash and a small quantity of acetate of mercury, this cylinder turns on rubbing lightly a plate of platinum bound to a film of mica; when these undulating currents pass from a carbon transmitter arriving in this acceptable they translate their effect in augmenting or diminishing the resistance due to the friction of the cylinder against the metal and determine the displacements of the sheet of mica which <sup>plate</sup> vibrates synchronically with the undulatory current and consequently synchronically also with the plate of the transmitter. The result obtained is surprising and will not fail to meet with great success with the visitors.

These numerous apparatus, so remarkable are grouped with much method in the two saloons consecrated to Edison. This exposition has been organized by the care of many co-laborers of the celebrated philosopher among whom we cite one of the most sympathetic and distinguished Mr. Otto A. Hoes. We would also mention the name of Mr. Charles Butcher a philosopher of great valor who unceasingly employs his talents and energy in behalf of Mr. Edison.



- Nous sommes à la veille d'un changement si complet de toutes nos habitudes ou manières

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[illegible][illegible][illegible][illegible][illegible]

...the current passes; one ladder being blown, and this  
...large in the centre of the gallery was lit by a great  
...of Mexican lights, which gave very brilliant illumination, but  
...the lights were not so numerous as in the other galleries,  
...are innumerable or white, they being included in places of  
...; but from the stencils of the lights I took care to be of the loose  
...the lights were not so numerous as in the other galleries,  
...the light was thrown upwards on to reflectors about 2 feet in diameter  
...There was an occult mixture of shadow, and the light generally  
...a faint daylight appearance. These lamps were perfectly  
...I had not time to go to the gallery, but I saw  
...all of the lights I had seen. Passing through the next  
...room was lit by the Gramme light, a room was reached in which  
...I saw, Berlin, and several instances, of which I took no little  
...I cannot give any description whatever of them.  
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...I cannot give any description whatever of them.

four years, is still very far from perfect; and he could not do otherwise than come to the conclusion that gas, much abused as it is, is likely to hold its own, even for lighting purposes, for many years to come. That electric lighting is destined to occupy a very important position, no one can doubt; but it must be years removed before it will to any extent take the place of gas.

When I visited the exhibition in the first week in September, the arrangements were not quite complete, but they were sufficiently satisfactory to enable me to make a preliminary study of the apparatus. However, to obtain any reliable information as to the cost of producing and supplying the light, assertions that it can be produced at a cheaper rate than the light now used, or that it can be produced at all, were not substantiated. The light given off by any particular lamp is, in my opinion, very much exaggerated. I am not satisfied as to the subject to know how the power of the light is arrived at, but I have heard it stated that it is obtained by multiplying the power of the light by the area of the surface to obtain the correct value, on the supposition that the light shines in every direction. This seems to me most

If a light is placed in the center of a circle, it will radiate light upon every part of the circumference of the circle. In the same manner, the electric light would be quite as reasonable a method, instead of being lost to anything more salubrious; but if this principle be laid upon the electric lamp, it is equally applicable to any other kind of lighting, whether by gas or candle. It is available for domestic illumination, neither is the Japer light, of which I have already spoken. The blowing, lighting and extinguishing of the arc light are undesirable in the extreme, being attended with much noise and smoke. When it becomes possible to establish a current to any desired extent—which has not yet been attained, however—standing the claims made by Edison and others, it would be to be introduced with opportunity for saving the time and money which are now lost in the necessity of a desired and money is plentiful, and even when this takes place, it cannot be said that it will affect the quantity of gas required.

10

10 NOVEMBRE 1901  
L'ILLUMINATION  
L'ÉCLAIRAGE ÉLECTRIQUE  
DU FOYER DE L'OPÉRA

Si la merveilleuse application des lampes électriques d'Edison a été faite avec impulsion, c'est au foyer de l'Opéra. Cela faisait peine de voir s'en aller en fumée tout ce monde gracieux, aérien, que Husary a fait vivre dans les tableaux du plafond. C'était d'œuvre en ruine, hélas ! Les toiles sont tassées de longues taches grises et jaunies, vieillies, de ci de là, quelque draperie jaunée. Le plafond du foyer a l'air d'une vaste frange que des flammes suraient brûlée. Les bleus, les roses, toutes ces colorations tendres dont Husary enveloppe ses créations sont devenues gris clair ou des gris foncés. Les paysages caqués, peints dans les médaillons des vitraux, sont déformés. Il y en avait un surtout, charmant, une enfant, une fillette courant dans les rochers derrière lesquels un ruisseau forait ses cailloux d'argent. Le gaz a dévoré l'enfant, la verdure et l'eau. Le ruisseau s'est enfumé ; c'est à peine si la pensée de l'artiste, si son dessin ferme et fier est resté debout dans la ruine, affirmant que quelque un a vécu là.

Hâtons-nous de dire que la lumière Edison arrive encore à temps pour sauver d'admirables morceaux des musées. Elles ont d'une facture plus robuste que la composition allégorique du panneau principal ou de ceux des voussures. Toujours est-il qu'elles ont mieux résisté. Turlupachère a conservé sa puissance et sa grâce en chassant son vol d'Albatros à la même forme de chair qu'un premier jour et le bleu léger de sa draperie n'est que légèrement décoloré.

Le dessin que nous publions, du foyer de l'Opéra, éclairé avec la lampe Edison, ne donne qu'une faible idée du résultat obtenu au point de vue de l'éclairage seulement. Ceux de nos lecteurs qui ont suivi dans nos précédents numéros notre étude sur le système Edison savent que la lumière des lampes du système américain brille dans un globe fermé et allongé si peu de chaleur qu'on peut le presser dans sa main sans aucun danger ; donc, plus de crainte de voir se détacher les ébauches d'œuvre sous l'action de la chaleur des lustres. La question de la conservation des peintures est définitivement résolue. Reste à examiner celle de la puissance d'éclairage et de l'effet produit.

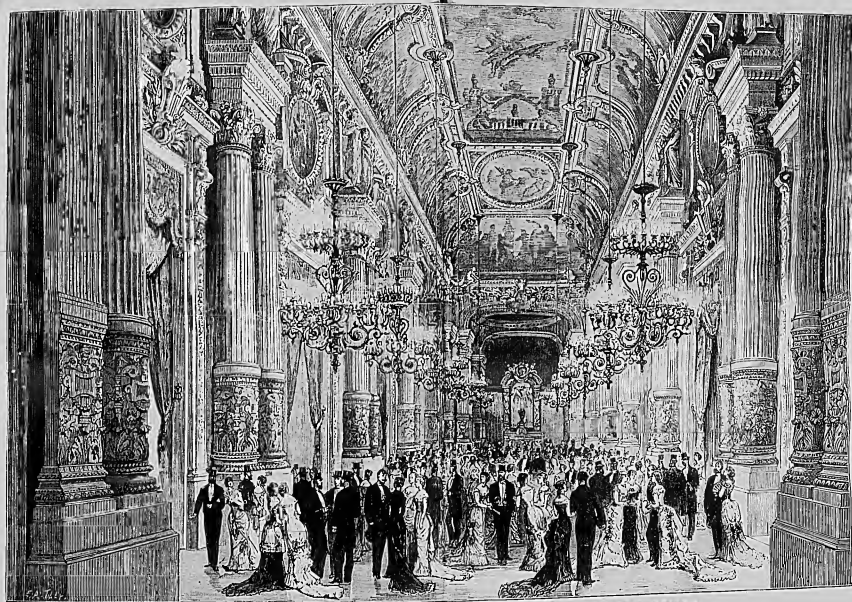
Les lampes Edison répandent, on le sait, une lumière douce, absolument fixe. Il y eut un mouvement général de surprise au premier essai d'essai d'essai, le soir où elles furent allumées pour la première fois. Aux flammes ternes et vacillantes du gaz succédait une lumière d'une immobilité complète et en même temps si intense et si pure qu'elle blanchissait l'ombre profonde dont le plafond, ce haut, du foyer de l'Opéra, était toujours dépourvu.

Les dix lustres portant chacun six lampes ressemblent, à cause de l'immobilité de leurs quatre lustres, à d'énormes pièces d'orfèvrerie ornées de pierres éblouissantes. Les ornements colonnaires, leurs motifs décoratifs, les merveilleux détails des chandeliers de chaque extrémité du foyer, toute son ornementation élégante et riche, sont mis en pleine lumière.

La physionomie des promeneurs des entrées s'est également modifiée depuis l'application des lampes Edison. Les spectateurs s'y montrent plus animés, comme s'ils arrivaient toujours dans les entrées bien éclairées. On y voit plus volontiers qu'autrefois, les dames surtout par curiosité d'abord, par coquetterie ensuite. Le foyer de l'Opéra, jusqu'ici, semblait des

lustrer sans lumière ; ils ont à leur tête un même temps qu'elle fouille les dessous les plus fins de leurs dentelles, sans rien changer aux garnitures, aux bleus, aux roses ou autres couleurs de leurs vêtements.

Monsieur Edison dit que les lustres sont garnis de 460 lampes Edison. Il faut ajouter à ce chiffre 152 lampes du même inventeur, posées sur les candélabres des coins du foyer, soit un total de 612 lampes. L'électricité qui les alimente est produite par des machines dynamo-électriques Edison du petit modèle, semblable à celui que nous avons publié dans un précédent numéro. Ces machines, au nombre de sept, sont abritées avec la locomobile à vapeur qui les actionne sous un petit hangar élevé dans une annexe du foyer sur la rue Scribe. Cette installation des moteurs et des machines est faite provisoirement, bien entendu. Dès que les expériences seront terminées, des locaux seront mis dans les sous-sols à la disposition de M. Edison, pour y installer définitivement son matériel.



LE FOYER DE L'OPERA ECLAIRE A LA LUMIERE ELECTRIQUE (SYSTEME EDISON)

THE THEATRE

ILLUSTRATION

THE - THE

156-10700-107100

**ENGINEERING AND MINING JOURNAL**

## AUGUST 27, 1881.

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10. 11. 2017

PARIS, Oct. 20.

The jury have now completed their labours, and the awards will be made known and the distribution of diplomas will take place to-morrow. I have already described the general constitution of the jury. A bureau was formed, of which M. Tolosone de Bert is president, and the vice-presidents are Professor Barker, of Pennsylvania; M. Belpaire, of Belgium; Professor Schuster, of Padua; Dr. J. Harris, of London; and M. de la Rue, of Paris. The secretary is M. Mascart, the reporter to the bureau. The various exhibits were divided into five groups, among which the 150 jurors were distributed, each subdivided into sections. The first group comprised electric lamps, dynamo-machines, electro-motors, and motive power. The second included telegraph apparatus, cables, telephones, etc.

[illegible]

The awards are of six kinds. The grand diploma of honour, reserved altogether for Government administrations; then the diploma of honour, which is above all medals and *lettres de coopération*; there are three classes of medals—gold, silver, and bronze. Of the very few grand diplomas which are given, one is awarded to the Postmaster-General of Great Britain for his exhibit of telegraphic apparatus.

Grand diplomas have also been given to the French, German, Austrian, and Belgian Post Offices; and ordinary diplomas have been given to various Ministers of departments in different

Mr. of the personal diploma at honour  
 his work for inventions which I have already  
 described in previous correspondence. Sir Wil-  
 liam Thomson stands out pre-eminently as  
 the man deserving such an honour. Devot-  
 ing his life chiefly to pursuits purely scien-  
 tific, he has been able to give  
 his attention to the application of his  
 to the arts of telegraphy and navigation, until, at  
 present, the world looks on him more as the great  
 electrical engineer than as the great professor.  
 In electrometers in the University of Glasgow  
 is written as the process of development extend-  
 ing over a hundred years, and the science and  
 skill which are seen at every stage. The  
 absolute and quadrant electrometers now shown in  
 the exhibition. His siphon recorder, for marking  
 the variations of the magnetic force, and the  
 method of measuring the magnetic force, are  
 involved by the same principle, although the

expensive to construct, remains still the only instrument available for the purpose. It is shown here working on Muirhead's duplex system through a great length of artificial cable. His compass is known to be most admirably adapted to correct the magnetic effect of iron ships, and his apparatus for taking soundings in deep water is also of the very best.

Scientifically, while his name has been prominently before the public of late in connexion with his experiments on the Fensie battery. But it is more for his position as a scientific man than for his inventions that this great honour has been

[illegible]

M. Baudo receives the diploma in honour for his telegraph apparatus, the ingenuity of which is incontestable, although it is a little complicated. When he first conceived the notion of this instrument the French Government gave him six months' holiday from his duties at the post office and 10,000*fr.* to complete the invention. The British Post Office hardly gives such encourage-

I am glad to say that Dr. Bjerknes receives the same honour for his researches on the analogies between the problems of fluid vibrations and magnetism and electricity, and for the beautiful experiments with which he demonstrates the same in the exhibition. I have given some account of his work already, and have only to say that he has been adding to his experiments during the time of the exhibition. Mr. Edison gets the diploma of honour for his numerous inventions in connexion with electric lighting and

It consists of a balance, to the two arms of which cylinders of copper are suspended, which rest in a vessel full of sulphate of copper. A current passed to the vessel decomposing the copper on one cylinder and depositing it on the other, causes the balance to oscillate. The current is so regulated that it tips the balance over and reverses the current and so the decomposition takes place in the reverse way. The successive changes of position are registered on a counter which once belonged to a gasator, and that he measured the volume of gas evolved in a cubic foot of gas." [M. Planté is similarly honoured for his invention of the secondary battery which bears his name. It is nearly the same in principle as the Faure battery. But M. Planté seems never to have been able to get his electricity out of a battery which was self-discharged at a loss. His great ambition

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In completing my remarks on those awards of the diploma of honour, I am sure I have mentioned a great number of scientific men and men of letters, generally, who have been the recipients of the same in the list deserving the highest recognition of such an exhibition as this held in Paris. I am sure that I have not forgotten any of those who are similarly awarded—viz.—Sienens and Halasko, Berlin; Dreygout, Paris; Christophe, Paris; and the late Sir John Lubbock, London; and the Telegraph Engineers, London; Messrs. Siemens Brothers, London. The Submarine Telegraph Company, the Eastern Telegraph Company, and the Commercial Cable Company are also amongst those who have also received this award.

With respect to these, I must specially draw attention to the fact that the same men and those who have done everything to make the British exhibit a success, and whose efforts in that direction were generally acknowledged publicly by the Emperor of the Germans, and the Emperor of Austria, Mr. Berger, the Commissioner-General, should also repeat what I have said on a former occasion, that the exhibition of the telegraph and of the electrical science, and have shown so much attention in connection with this exhibition, that they rightly deserve the highest award which can be

*Letters of Co-operation* have been given in the British Department to the Royal Institution of Great Britain and to King's College, London. The former shows a fine collection of the apparatus used by Faraday in the great experiments which he carried out in the great exhibition are the original coils and electro-magnets with which he proved that currents are induced in wires when they move in the neighbourhood of the pole of a magnet. It is this grand discovery which has led to all the various types of dynamo and magnet machines which are used in the world. King's College has a very complete set of the apparatus used by Wheatstone in the long course of time during which he was inventing and improving telegraphic instruments. There are other interesting pieces of apparatus in the Wheatstone collection which it would be superfluous to enumerate.

I will now say something about the gold medals awarded in the British section. Electric lighting is the most important matter in the exhibition, and I will commence with that subject. Sir Humphry Davy showed the carbon arc light, the first current passed between the tips of a pair of two carbon rods, the points become heated, and on separating them to a short distance an arc of light shoots between them, and the carbon arc raised to a white heat. All lamps until lately used this point which chiefly consisted in the use of a carbon arrangement which should keep the carbon points at the fixed distance which was found to be most advantageous. Foucault first accomplished this perfectly by forcing the carbons so that they burnt away by clockwork. He did not make the clock-

[illegible][illegible]

Crompton has been working on this for some time. He has also constructed models with rods, with Soren's incandescence lamp in the interior of a thick glass globe, and with rods, covered by metal rods. Those lamps, by electric current, have been considered so satisfactory that the three collieries have been already fitted with them. One of which is the Risco Colliery, of unenviable notoriety. The British Electric Light Company also receive a gold medal, partly for their incandescence lamp, but mainly for their Brodie's lamp, which is a light Cammen-street lamp successfully. The principle of this lamp is to make the "stroke" at regular intervals, determined by the steam-engine which supplies the current. About once a minute the current

Silver Medal.—Ayer, Ayron and Ferry, Brotherhood Consolidated Telephone Company, Fyle, Johnson and

Over objection to this form of candle in the color, and another is the flickering. The color comes chiefly from the kaolin or other substances used, and it has been found quite possible to dispense with this substance and simply to use two rods of carbon standing side by side. In fact, this is the original form used by Mr. Wilde. So soon as we have made the rods pass, the self-repulsion from the rods drives the flame off by the laws of Ampère) to the ends of the rods. This system has been adopted by Mr. J. J. Thoms, and it is a slight modification. Parallel to the outside, in the plane of the rods, is a wire, and separated from them by several inches, he coils a wire around them several times and leads a current through it. The inductive action of this current drives the light away beyond the points of the carbon, as if

Mr. Swan's lamp consists of a filament of carbon in vacuo. This thread

perfect, the public requires resources and commitment to

The Electrical Exhibition is now nearly complete. There are daily con-

forenoon at 10 o'clock. These consist of a lecture in the Congress room, followed by a visit to the special objects described.

The illumination of the building at night is very complete. All classes of lamps are shown in the grand nave, and the separate rooms in the upper story are each illuminated by a separate system. The number of visitors at night far exceeds that in the daytime. One of the chief objects of popular interest is the connection by means of telephones and microphones of the Palais de l'Electricité with the Opera and the Theatre Francaise. I described the arrangements and the results in a letter a few days ago, before it was open to the public. My expectations as to its popularity have been fully confirmed. It has been found advisable to connect all the available telephones with the Opera, and to suspend for the present altogether the Theatre Francaise. Thirty-two persons can now listen all at once to the opera in the Palais de l'Electricité. The Opera is open on Mondays, Wednesdays, and Fridays; and last Friday there were 3700 visitors who listened to the performance. Each person is allowed the use of a telephone for five minutes, at a price of a franc and a half. The string of persons waiting for their turn extends the whole length of the gallery.

The electrical tramway of Messrs. Siemens Brothers has been running. It carries 40 persons at a time. Three different systems of contact for receiving the electricity have been tried in succession; the machinery has been injured, and the car has not run for the last few days; but it is expected to be immediately repaired.

[The following extract from *Le Matin*, of date of August 27, will show that not the least interesting feature of the exhibition is the display of the different gas motors, as arranged by the French Gas Motor Company, of which M. Chabert is President.—ED. A. G. L. S.]

at two occurrences or more.

The word "station" can be truly applied to the prolonged stop made by M. Gambetta last evening during his visit to the exposition of electricity before the French Company's gas engines. He remained not less than ten minutes before these very interesting machines, which represent 500 horse power, and at which there are different types, making up the whole gamut of motive power, from the 1-horse to the 50-horse power motor.

M. Gambetta informed himself even to the minutest details of the method of starting instantaneously the Otto motors, and also as to their absolute safety, by reason of the absence of all heat in working them. (He followed these details with both eyes and ears.) Information about the machines was given him by M. Chabert, director of the French Gas Motor Company, who was introduced by M. Berger, Commissioner-General, and also M. Langen, the illustrious scientist from Cologne, the inventor of the machines.

After having demonstrated the advantages of the Otto motor in illuminating theatres and public buildings, where there is but slight danger of fire, M. Chabert also explained how, on the contrary, these motors could be of great help in case of fire. The President of the French Gas Motor Company has just been furnished three appliances. Two Otto motors of 50-horse power each have been placed inside the fire engine in such a way that the engine, in case of need, can be immediately put in action by the two motors, or by one of them. By simply starting the machine the fire is flooded with water before it has had time to gain headway.

M. Chabert afterward explained to M. Gambetta how the Otto motor is likely to revolutionize all our modern industries. A most sensitive experiment was made at Saint Etienne, thanks to the Otto motor, all the hand-made articles of this great producing center can now be made by machinery which will enable the manufacturers of Saint Etienne to compete successfully with the Germans and Swedes.

M. Gambetta thanked M. Chabert for his explanations, and also congratulated M. Berger on his good judgment in having devoted so large a space to this very interesting section of the exposition of electricity.

There is no exaggeration, therefore, in saying that the French Gas Motor Company made the greatest success of the evening.



**Menlo Park Scrapbook, Cat. 1069**

This scrapbook covers the period June-November 1881 and contains clippings relating to the Paris Electrical Exhibition of 1881. Included are detailed descriptions of the exhibits of Edison's competitors, including Faure, Gramme, Jablochkoff, and Siemens. The spine is labeled "T. A. Edison No. 51." The book contains 142 numbered pages.

Blank pages not filmed: 1-7, 79-142.

Le Figaro. July 14 1881.

Paris. 24 juillet.

9

## UNE RÉVOLUTION DANS L'ÉCLAIRAGE

Il n'est question en ce moment, que des merveilles que nous promet l'exposition d'électricité, dont l'ouverture doit avoir lieu le mois prochain.

La Société américaine Edison pour la lumière électrique, qui vient d'installer ses bureaux, avenue de l'Opéra, n° 33, fait tous ses préparatifs pour occuper un rang digne d'elle et de l'illustre savant Edison.

Des installations grandioses et telles qu'on n'en aura jamais vu sont en voie d'exécution, pour la machine qui alimente 1,500 lampes électriques, distribuées entre le Palais de l'Industrie et les Champs-Élysées. Ce sera d'un effet prodigieux.

Du reste, la Société américaine veut complètement détrôner la lumière du gaz. Actuellement, elle a trois mille ouvriers qui travaillent à la fabrication des appareils destinés à l'éclairage de la ville de New-York. Et quinze mille lampes sont déjà placées dans New-York.

D'après les descriptions données par les journaux américains, cette lumière remplacera spécialement le gaz dans l'intérieur des maisons. Elle sera d'un usage aussi commode, aussi facile que le simple bec employé actuellement. C'est toute une révolution dans l'éclairage.

On assure que les perfectionnements apportés par M. Edison, dans son système d'éclairage électrique, ont donné des résultats très brillants et surtout très pratiques.

D.

Le Figaro. July 15 1881.

## LES ILLUMINATIONS

Nous avons fait plus haut la nomenclature des diverses illuminations, intéressantes qui ont eu lieu hier soir.

Il nous faut cependant revenir sur certaines attractions de la soirée, qui sont tout à fait en cadre.

Par exemple, l'illumination des Tuileries, la place de la Concorde, des Champs-Élysées et de l'arcade du Bois de Boulogne, n'ont eu un tel et ont réussi sans peine.

On en aura de reste une idée si l'on songe qu'il y avait :

Dans les Tuileries, 172 mâts et 103,740 verres de couleur.

Place de la Concorde et Champs-Élysées, 3,078 globes de gaz.

Avenue du Bois de Boulogne, 1,691 globes de gaz et 30,300 verres.

L'Arc-de-Triomphe de la porte Dauphine, 28 globes.

Au soleil de l'arc-de-triomphe, 2,812 jets de gaz.

Dans les avenues du Bois, 40,000 verres et 6,000 ballons aux arêtes.

Dans les îles, 47,000 verres.

Sur les bateaux, 12,000 ballons lumineux, etc., etc.

On juge qu'embrasement cela devait produire.

De tout heures à minuit, nos feux éternels s'est portés pour admirer ce spectacle. Nous n'avons attendu parler d'aucun accident.

Les feux d'artifice tirés sur le lac par Huguier ont été une merveille et ont fait un coup d'œil véritablement ravissant. Le roi des architectes, c'est elle encore, n'aurait pu surpasser. Il est vrai de dire que le décor se prêtait admirablement aux fantaisies pyrotechniques.

Dans une région opposée, il y a eu aussi de véritables « ciels » comme on dit en style de l'éclairage. L'illumination des faubourgs Saint-Martin et Saint-Denis forme les deux précédents.

Le faubourg Saint-Martin était éblouant. Pas de verres de couleur, pas de gaz ou à peu près ; rien qu'une série d'arcsades composées chacune de trois lustres en verres blancs ; mais ces arcsades très rapprochées, produisaient en perspective un effet magique et absolument saisissant.

Dans le faubourg Saint-Denis, un effet analogue, mais d'une coloration plus accentuée, était obtenu par une succession de guirlandes et de portiques garnis de ballons lumineux et de lustres de couleur du plus grand effet.

Très brillant encore l'arcade de l'Opéra avec son mélange de gaz d'électricité et de lanternes vénitiennes. Citons parmi les décorations les mieux réussies, celle de la Société d'émulation Edison, aux Champs-Élysées, où il y avait une véritable arête de trophées, de drapeaux et d'écussons aux couleurs françaises unies aux bandes américaines. C'était très brillant et organisé avec un goût exquis. Nous serions curieux de voir l'éclairage de cette splendide avenue de l'Opéra, confié aux soins de la Société Américaine. Nous sommes certains qu'elle en ferait un décor fortique.

A citer également les principales rues du quartier de l'Opéra et du quartier Saint-Denis ; le boulevard de Strasbourg, où le bal donné par les Classes indigènes a fort bien réussi ; le quartier de l'Hôtel de Ville, le dôme des Invalides tout couvert de feux qui descendent sur les courbes, etc.

Sur les grands boulevards, enfin, tout le monde a remarqué les immenses ballons de lumière qui, suspendus au milieu de la voie à la hauteur d'un troisième étage, avaient l'air d'étoiles fixes.

Ces ballons lumineux ont été placés là par la Compagnie lyonnaise d'éclairage par l'électricité, dont les services sont installés dans les bureaux de la banque de Lyon et de la Loire. Jamais on n'a obtenu par l'électricité un résultat plus brillant, aussi les bandes qui circulent en chantant la Marseillaise s'écartaient-elles, en passant sous chacune des appareils :

— Ohé ! la comète !

Comme d'habitude, vers minuit, quelques voyous sont venus brailer devant le magasin de porcelaine de la rue Drouot, et un valet de chambre a tiré tout un feu d'artifice, dont il a successivement sorti les diverses parties de ses poches. Cela a beaucoup amusé le quartier.

A la pointe du jour, comme la grande ville rentrait dans le calme, quatre jeunes gens, portant des lanternes dont les bougies jetaient des lueurs faibles, ont passé rue la Fayette, bras déployés, bras écartés, toutement, d'un air acrobate, de temps à autre scandant le pas, en ondoisant sur de leur bouche, ce chant qui semblait plutôt un encouragement, qu'un conseil :

... Marchons...

Marchons...

C'était un écho de la Marseillaise... et peu à peu l'écho s'affaiblissait... Quand les lueurs

au coin de la rue de Provence, il n'y en avait plus que trois qui clignaient. En face de la rue Rossini, il n'y en avait plus que deux. Enfin, arrivés au boulevard, un seul gémissait :  
... Chons !...

*Eprouve sur une bliche*  
*July 14. 1881*

LES ILLUMINATIONS

« L'électricité a joué un grand rôle dans la vie, et sa lumière a illuminé les boulevards, et est que les monuments publics. L'application la plus heureuse de l'électricité a été faite, avenue de l'Opéra, où, aux bureaux de la Sac à l'américaine Edison. Les représentations à Paris de cette Sac ont montré prodigieuses et nous devons en remercier ; ils n'étaient point tenus à manifester le 14 juillet, mais ils ont voulu participer à la fête de la France, en reconnaissance de ce que la France a participé à la grande fête de la délivrance de l'Amérique. »

La Société Edison nous prépare des surprises. Elle doit, lors de l'exposition d'électricité, mettre en action par une puissante machine quinze cents lampes dans le palais de l'Industrie et dans les Champs-Élysées. Ceci nous donnera une idée de l'éclairage de New-York, organisé par M. Edison et auquel travaillent en ce moment trois cents ouvriers pour monter les 11,000 lampes déjà commandées.

Nous n'entrerons pas dans les détails des différentes fêtes organisées par chaque arrondissement de Paris, et qui consistent presque toutes en royautes, concerts, théâtres forains, bals champêtres et jeux de toutes sortes. Il y a en rivalité entre tous les arrondissements, et l'on ne sait lequel a réuni le plus d'attractions.

Nous devons cependant citer les rues suivantes, qui, décorées par l'initiative privée, étaient féeriques et transformées en routes de verdure, de drapeaux multicolores :

Rue de la Goutte d'Or, de Flandres, des Charbonniers, Leprie, Beaumont, Quinquempoix, Roumain, Philippe de Gérard, de la Roquette, rue Solaime, rue des Tailleurs, faubourg Saint-Antoine, rue de Rivoli, faubourg Saint-Denis, faubourg Saint-Martin, rue Saint-Martin, rue du Temple, rue de Rambuteau, etc.

Nous avons parlé dernièrement d'une expérience très curieuse, qui a été faite dans les bureaux de notre journal par M. Endrès, ingénieur civil.

Au moyen d'un mécanisme des plus ingénieux, qui peut s'adapter à tout appareil à gaz, M. Endrès est arrivé à allumer et éteindre le gaz instantanément par une simple pression d'air.

Ce procédé, qui est appelé à rendre de grands services à tous ceux qui se servent de gaz, sera de nouveau expérimenté dans les bureaux du journal. Les personnes qui pourraient intéresser cette nouvelle expérience seront avisées prochainement du jour et de l'heure qui se désignent.

*World. Aug. 11. 1881*

The United States Electric Light at Paris.  
The United States Electric Lighting Co.,  
100 Broadway, New York, August 11.

To the Editors of The World,  
Sirs: I notice in your paper this morning under the head of cable news an account of the opening of the Paris electric light exhibition, in which it is stated that Edison's display promises were compared to be one of the most popular in the exhibition. Our display is the exhibition is strangely not referred to, although it was ready at the opening. On the 10th floor we have a large room which we have lighted by the Edison incandescent lights. These lights are exhibited in various forms, with brackets, chandeliers, and with reflectors. We also have exhibited our various types of electric lighting.  
We have gone to considerable expense to have this exhibition get ready in time for the opening, and it seems very strange to us that a cable is sent of what Edison promises to do and no notice what of what Edison promises have been made. We had their work established and were ready to exhibit at the opening, and our Mr. Loran H. Maxim goes over by the steamer sailing on Saturday to Paris to be present at the exhibition. I send you information thinking that you may extract from it matter that will be of interest to your readers. Very truly yours,  
CHAS. R. PLINT, President.

*World. Aug. 11. 1881*

FROM THE EVENING TELEGRAM OF YESTERDAY.  
THE ELECTRIC EXHIBITION.

VIA FRENCH ATLANTIC CABLE TO THE EVENING TELEGRAM.

PARIS, August 10.—The International Exhibition of Electricity was officially opened this morning. At a quarter to eleven o'clock President Grévy arrived, accompanied by the Ministers of Marine, Foreign Affairs and Posts and Telegraphs, M. de Lesseps, M. Berger, Commissioner General of the Exhibition, and a few other officials. On the announcement of the President's arrival, the band of the Gendarmes, stationed in the centre of the palace, struck up the "Marseillaise," and present music. The President then passed the Exhibition rapidly in review, beginning with the British section and so on through the German, Scandinavian, American and Belgian sections in the department reserved exclusively for the French.

AN AMERICAN WELCOME.

At the United States section he was received by Mr. Norton, the American Ambassador, with whom the President exchanged a few courtesies. The Exhibition has been completely transformed since yesterday and it looks gayly decorated with flags and trophies, making it look rather pretty. Much remains to be done, however. The German, French and Belgian sections are very forward, but the United States and part of the British sections have much to present in the imagination of the visitor. The electric railway is almost finished, but is not yet in working order. The gorgeous electric boat and the so-called Tuscaner balloon were, however, ready for exhibition, and attracted a great deal of attention. Edison's display promises, when completed, to be one of the most popular in the exhibition. By Sunday night 500 Edison lights will be burning in a room on the first floor especially fitted up for

*Le Globe Français*  
*Feb. 25. 1881*

... M. Grévy, the President, and other distinguished persons were present, to a telegraphic entertainment. Yesterday, when had been started in communication with the Opera, and in view of the opera house were heard with perfect distinctness. At half-past twelve the President left the building, expressing himself as well gratified and looking, perhaps, a trifle tired.

Yours Aug. 12, 1881

**THE ELECTRICAL EXHIBITION.**  
PUBLIC OPENING IN PARIS—ARRANGEMENT AND CONDITION OF THE EXHIBITS.

PARIS, Aug. 11.—The opening of the International Electrical Exhibition here yesterday was a private view. The exhibition is in a very curious state. Edison's exhibit was the object of much curiosity. An electrical machine will in a few days generate in the Edison show, which will be monopolized by fear of electricity, and will telegraph 1,200 words per minute. England and Germany occupy the most space of the foreign countries represented. Next in importance are Belgium and America. Correspondents state that France seems to have lost realized the scientific and commercial importance of the exhibition, but, of course, she has a great advantage in not having to bring her exhibits from a distance, and from the contrary manner in which the Government Telegraph Department and the Ministry of War and Marine have co-operated. Among the private exhibits which created the most interest in the French department are Trouve's electrical boxes and Ponce's electrical accumulator, by which electricity may be stored. The German department is not much more advanced than the American, notwithstanding the former did not have to encounter the delays of a long sea transit. The Americans complain much of the fearful unreliability of French workmen, who seem to have no idea of the value of time. Edison's great interest, if possible, is to obtain the loan of wires connecting the French section with the Théâtre Français and the Opera. He claims that in will be able to make performance suitable to a large audience by telephone. The German system is principally devoted to the application of electricity to military and nautical purposes. The English Government exhibits are principally of historical interest, and consist of all instruments used since 1837. The exhibition was today thrown open to the public.

Yours Aug. 12, 1881

The Electric Exhibition in Paris. It is to be regretted that our share in the interesting exhibition of electric science in Paris should be behindhand. Americans are not done as well as the reputation of the country for energy would expect in the International Exhibition. But we generally manage to come to the front in the long run and to make a display worthy of the genius of the country. In the exposition of electrical science Americans should take a prominent part. There is no department of human endeavor in which we have made so great an advance as in electrical science. One of the earliest and most enduring classes of Franklin to immortality was a discovery in electricity. We were more the magnificent discovery of the telegraph. Bell has supplemented this with his infant invention of the telephone,

which promises to be as great an achievement in its way as the discovery of Franklin and Morse. Edison has been a world's fame by his improvement upon the telephone, by his photograph, and especially his efforts to solve the problem of electric light. We look to great results from this exhibition of electrical science, and we should be very much disappointed if in the end America did not show that in this, as in other things, she leads the world.

Yours Aug. 12, 1881

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[BY CABLE TO THE HERALD.]

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Yours Aug. 12, 1881

**M. Henri Sainte-Claire Deville.**

M. Sainte-Claire Deville, de l'Académie des sciences, vient de mourir à Boulogne-sur-Mer, après une longue maladie.

M. Sainte-Claire Deville était un des nos plus savants chimistes; ses travaux sont considérables, et l'œuvre qu'il laisse derrière lui des plus importantes. Sans compter ses recherches sur l'aluminium, qu'il a, pour ainsi dire, découvert une seconde fois, et dont il a, tout au moins, mis en relief les propriétés spéciales, on doit porter à son actif une nouvelle méthode d'analyse chimique, dite de *voie moyenne*, qui consiste dans l'emploi exclusif des gaz et des réactifs volatils. Nous ne sommes pas assez compétents pour juger à sa valeur cette importante découverte. Nous nous contenterons donc de la citer avec les autres travaux de M. Sainte-Claire Deville.

En 1840, il fit connaître la préparation et les propriétés de l'acide nitrique anhydre; en 1852, il publia un important mémoire sur les carbonates métalliques et leurs combinaisons. Puis, venant ses études sur l'aluminium, il s'occupait, sur ce métal, de nombreuses expériences, à l'usine de Javel, de concert avec M. Debray, et obtint plusieurs lingots qui figurèrent à l'Exposition de 1855. Un important ouvrage sur cette question, qu'il publia en 1859, l'*Aluminium, ses propriétés et sa fabrication*, le fit nommer membre de l'Académie des sciences. Puis il fit paraître des études sur les trois états métalliques du silicium, un mémoire sur la métallurgie du platine, etc., etc.

M. Sainte-Claire Deville était né en 1818, aux Antilles, et avait fait ses études en France. En 1844, déjà connu par ses travaux, il fut chargé d'organiser la Faculté des sciences de Béziers, dont il fut nommé doyen l'année qui suivit. En 1851, il succéda à M. P. d. dans la







[illegible]

But why, you will say, all this would-be wisdom about dynamo-generators, when we want to know about the Elements motor? First, because the machine we have been studying is at the bottom of a large share of the wonders in the Exhibition; and we shall find it in our way, literally and figuratively, every step. Second, because the Elements motor is simply an ordinary generator, worked backward. Try a rude illustration of a familiar kind. Suppose a man, working an ordinary garden-engine by a crank or pump-handle, movement. Applying his muscular force to the wheel or lever, he will note in the piston and spurs a stream of water out.

[illegible][illegible]

As we pass around the south-west corner, on the left we come up a row of " queer birds," as the little boy called the Muscivores—long, black beak holder with long tail, still in fume weeks—the theory at their mouth of the Anglo-American Drusi Company, used to run the five large Drusi dynamos, one of which, with a polished iron armature and bright copper commutators, is whirling and buzzing right at hand. When we gaze, the inventor himself passes by, and a slight solicitation, sits down for a two hours' discussion in which he tells us clearly and forcibly more about electric machines than we ever learned before. The " wringing " so often noticed in his Drusi lamps is merely due, he declares, to sudden

of lights, or to carelessness and mismanagement of the steam force at the central station. With proper protection it should be reduced to a very small minimum. In steadiness and brilliancy he claims for his own (are) light little or no superiority over the best of the systems—Stearns, Gram and others—now on exhibition; but he does claim to get more effect out of a given power, hence greater cheapness to the consumer—a vital point.

Before, quelling the English's sense, what  
to fate, and except  
is suitable for "nothing but emptiness," we  
blame it for "nothing but emptiness," we  
in the English section across the way  
will be five-foot glass  
knacks on bay pumpkins, and the history of  
more Lavers than about the time of Canyons. It will  
be to "nothing" but  
will be pleasant to watch it from a distance. And  
the untranslatable here  
to pumpkins, so to speak, by quality holding up the air  
of ground weighed with  
pumpkins. Further up, on the right of the little  
is ground of beautiful blue  
view-wrapping of the fields is replaced by  
prominent masses of light  
thing back as solids as a corner-stone  
The Indian section is  
is crowded with a variety of devices, in which long  
predominant railway  
gold autumnal rosettes, lanterns, lightning rods  
and stars is illustrated by  
of the monument to Leopold I. in Leuven  
buttery medieval, evokes, and  
Their large glass panes in full of autumn  
Impulse circumference in this line. Stop it stands  
a colossal mass of  
for the accurate representation of large pieces of  
climate, where a gradual  
Cane leaves the greatest activity. Close by is  
fluid lightning rods, and  
twenty to be reeled off at a gallop, his  
dark, opening  
the pavilion bears a first Jager  
right, which we find  
with beehive steads. "Bees will  
"It grumbles the other  
an electrified bang—like that of dynamite all to  
"Look at that great  
electric lanterns), and again at the  
gold golden plate of corner, four feet square and  
centimetres thick. "I saw  
electrode; and again at that beehive  
with twelve black  
rolling, the result of which hang on in  
dark cloud, beehive  
tail of wind, temperature, etc., in waving lines  
a rain-streaked field.

[illegible]

What an invention! The idea for the water pipe in a newspaper office tradition has it that the inventor hit on the idea from noticing the fine ash of his tobacco pipe fly up to a hard rubber pencil which he was using for a tobacco stopper. See page 2, 1900.

[illegible]





29. The following terms to convey certain meanings. Should this nomenclature be universally adopted, much progress will have been made toward bringing order out of confusion in discussing the scientific problems involved in the development of the practical application of the state of the art.

Mr. George Simon Ohm, a German physicist, more than fifty years ago set forth the law in accordance with which the electromotive force in a voltaic battery could be measured. The unit of this force is called a volt, and Volts; the unit of resistance is called an ohm. These are terms that have been tolerably well understood for some time, and are adopted by the Congress; and, in addition to these, other terms expressing relations between these two fundamental terms have been agreed to.

The current produced by a "Volt" in a conductor having an "Ohm" resistance is to be called an AMPERE, after a distinguished Frenchman who made important discoveries in electro-magnetism in 1822-1826, regarding the relations of electro-currents to themselves and to magnets.

The amount of electricity that an Ampère gives in *one second of time* is to be called a coulomb, from the name of another notable investigator of the laws of electrical repulsion and attraction.

The name of Faraday is preserved by the adoption of the term FARAD which is to signify a unit of capacity in currents when the conditions are such that a "Coulomb" is a "Farad" in current.

Thus we see the men of Science meeting together, and in the youth of electrical progress making for themselves a language—or, rather, agreeing upon the fundamental basis of a language yet destined to be largely enriched and extended. Truly, this is an age of speculation, and well-stored and evenly-balanced must be the mind that can carry, without frequent loss, the technicalities of almost any branch of Science.

Thus far we have viewed the Exhibition in what we deem its more important aspect as marking a way station on the great international highway of scientific progress. As to the display it certainly must be most interesting, for few people have an idea of the multitude of useful appliances which are actuated by electricity. How many of them are to be seen side by side, and a volume of many pages would be required to enumerate and explain them.

[illegible]

One other point has been demonstrated by this exhibition, viz., that the use of electricity is not free from danger. The *London Observer*, of Sept. 24th, said—

[illegible][illegible]

Of course the householder could not smell the danger, and would only become aware of it when he found his premises on fire. These accidents have happened in New York city, through an electric light wire coming in contact with a telephone wire and setting fire to offices where the boxes are placed.

To condense the whole matter as to cost of electric lights into an estimate is not an easy matter; but of one thing there can be no doubt, viz., that for the arc lights there is practically required one-horse power per thousand candles, so-called, and for all the forms of incandescent lamps from 100 to 110 candles may be obtained per horse power in practical working. These results we have given before, and there seems no reason for changing the figures from anything thus far developed by the electrical exhibition in Paris.

### Improved Street Lighting in Boston

The Boston Gas Light Company, of Boston, Massachusetts, is giving the citizens of that city an excellent example of what can be done in this way of improved street lighting by gas. A recent number of the *Manufacturers Gazette* contains the following account of what has already been done there in this direction :

"Since the introduction of the electric light for street lighting purposes the Boston Gas Light Company has been supplying the people what can be accomplished with gas. Two lights have been put up, one in front of the City Hall, and the other in front of the Masonic Temple. The City Hall comes from a cluster of six fifty-candle power Bunsen burners, which are arranged so that, the extremities of the lanterns meeting, complete one of light is forced, and the sixth is in the center. This error, and the lanterns are designed and made under the direction of Mr. English make, and is called the Wegg burner. The Masonic Temple burner is of the same kind, and is called the Wegg burner. The lantern and burner were

\*This is of the Argand description, is formed of pierced rings of lava, and as a light of 200-candle power.

The company tried a burner of 400-candle power in this lantern a few nights, but the argands are particularly sensitive to a variation in pressure, and it was found that it was not suitable.

smaller light was made necessary. The company has just imported from France a number of Siemens burners, to which they will soon give a trial. The peculiarity of this burner is that the heat arising from the flame is conducted, through a tube, back to the light again, to assist combustion and give strength to the light. These large lights have been used with great success in London and Paris.

American Institute of Mining Engineers.

The Harriessburgh meeting of the American Institute of Mining Engineers commences on Tuesday, October 26th, and continues on the 26th, 27th, 28th. Addresses of welcome are expected from the Governor of the Commonwealth of Pennsylvania, and the Mayor of Harriessburgh.

Participants of the Institute will be at the Loochik Henno, where a list of rates has been obtained. Secretary Brown requests that those who wish to be present at the meeting will notify him as speedily as possible so that he may be enabled to secure proper accommodations. A very enjoyable programme has been arranged for the occasion, which includes a reception tendered by the citizens of Harbinburgh and their wives and visiting members and ladies. On Wednesday afternoon, the 14th, the

**\$2.20 per Annum**

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FIG. 4.-SIEMENS STEAM DYNAMO-ELECTRIC MACHINE FOR ELECTRIC RAILWAY.

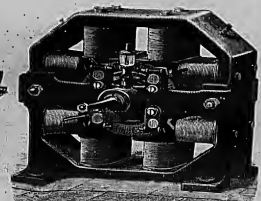


FIG. 2. - ORAMME MACHINE GENERATING CURRENTS FOR LONG DISTANCES.

THE INTERNATIONAL ELECTRICAL EXHIBITION OF 1881 AT PARIS





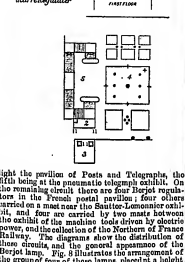
## MOTIVE POWER AT THE PARIS ELECTRIC EXHIBITION.—No. VIII.

MM. GUY AND GUANDAMINI, of Paris, exhibit two fixed engines, one of which, of about three horse power, has assisted in the general lighting at the Palais de l'Industrie during the Exhibition. The second engine, of 25 horse power, has been recently added to provide power for the incandescent lamps made by the jury with the electric lighting machine. The same firm has also a semi-portable engine at the exhibit of the Force of Luminous Company. These engines do not present any very special character; they have all single cylinders; the first named only being a condensing engine. They are, however, excellently made, and these makers enjoy a high reputation in France. The following are the principal dimensions of the two first-named engines:

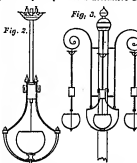
Nettall horse power	25	25
Diameter of cylinder	13.75 in.	12.5 in.
Length of stroke	17.72 "	15.75 "
Coal per h.p. per hour	4.4	4.65 "
Consumption	3.22 h.p.	3.74 h.p.
Non-condensing	1.4	1.45 "
Diameter of shaft	2.11 in.	4.02 in.
Weight of flywheels	1.9 tons	1.4 tons
Diameter	43.75 in.	51.11 in.
Number of revolutions	85	90
Total weight	5,500	4,150
With condenser	5,500	3,500
Without	5,500	3,500

The largest of the three engines is arranged for driving two De Meritens' alternating magneto-electric machines. These machines are of the five disc type, designed especially for lightness work, and they are also fed thirty Jablochoff candles of normal type, or forty of the small Berjeot regulators. The actual distribution of the current amongst the lamps is as follows: The machine on the right-hand side supplies five circuits, on each of which ten lamps, namely, two Berjeot regulators of the same pattern placed near the gallery on the two columns adjacent to the engine of MM. Chaliguy and Guyot and Siemens and the Maxim machines; a Carre regulator placed in a room on one side of M. de Meritens' exhibit. This regulator is used to throw the image of the voltaic arc on a screen, for the instruction of visitors. The magneto-electric machine on the left supplies six small Berjeot regulators, of 50 Carrels each, in Salon No. 9 on the first circuit; four Jablochoff candles, burning in pairs in two open globes, carried on cast-iron unscrewed standards of the standard pattern of the Ville de Paris; there are on the second circuit, four of which

Small Berjeot Regulator  
Large  
Jablochoff Candle  
Small Lamp  
Carre Regulator



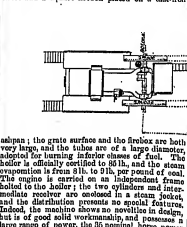
of about 12 ft. on a post between the telegraph pavilion and the machine gallery. The Berjeot regulator, of which the general appearance is given in Fig. 3, is a well-known system, which, as will be seen, is easily adapted to a decorative form. In



accordance with the arrangement now generally followed in electric lamps the rotating mechanism is placed in the upper part, so as not to obstruct the rays of light; the mechanism in this case is very neatly concealed. The regulator belongs to the class of differential lamps, like those of Leach and Gurnam, and of which the annexed sketch, Fig. 4, indicates the principle. If the resistance of the arc increases with the wearing away of the carbons, the quantity of electricity which passes by derivation and the electro-magnet E increases, when the magnet attracts the piece T held back by the spiral spring R, and causes the two carbons to



approach. This, however, is not the place to describe the Berjeot lamp, which we shall do, with detailed illustrations, on an early occasion. The engines installed at the Palais de l'Industrie by the syndicate are nearly all of them either of the class of steam distribution, or are compound; the motor exhibited by MM. Chaliguy and Guyot-Siemens, or Paris, belongs to the latter category. It is placed between the Parcel engine and that shown by the Hermann Luchapelle Works, and is a semi-portable engine and boiler, although the latter has not been used during the Exhibition, steam being less supplied by the Mayor engineers. The boiler is cylindrical, containing three tubes and a square firebox placed on a cast-iron



engine shown being capable of working up to 67 horse power.

It may however be interesting to mention an experience gained with one of MM. Chaliguy and Co.'s engines used in electric lighting. At the commencement of 1878 the Société Générale d'Electricité purchased a second-hand engine by these makers of 15 nominal horse power, and placed it in one of the pillars of the Opera for lighting the Plaza de l'Opera and the facade by Jablochoff candles. This engine has during the past four years been worked from three to eight hours a day, supplying the current to the incandescent lamps, with the resistance and immersion, 44, from 24 to 25 horse power; the repairs during this period having only been very slight. The engine at the Exhibition is not provided with a condenser, but provision is made for its application; the quantity of condensing water employed ranges from 44 to 55 gallons per horse power per hour. The following are the general particulars of the engine at the Palais de l'Industrie:

Nettall horse power	25
Maximum	67
Diameter of cylinder	13.75 in.
Length of stroke	17.72 "
Coal per h.p. per hour	4.4
Consumption	3.22 h.p.
Non-condensing	1.4
Diameter of shaft	2.11 in.
Weight of flywheels	1.9 tons
Diameter	43.75 in.
Number of revolutions	85
Total weight	5,500
With condenser	5,500
Without	5,500

Steam consumption per horse power per hour	3.22 h.p.
Coal	4.4
Consumption	3.22 h.p.
Non-condensing	1.4
Diameter of shaft	2.11 in.
Weight of flywheels	1.9 tons
Diameter	43.75 in.
Number of revolutions	85
Total weight	5,500
With condenser	5,500
Without	5,500

A very complete series of trials recently made with one of the engines gave results, of which the following is a summary:

Duration of trial	10 hours
Coal in high-pressure cylinder	45 lb.
Coal in low-pressure cylinder	85 lb.
Pressure of steam in boiler	85 lb.
Mean temperature of condensing water	55 deg. Fahr.
Average number of revolutions per minute	85
Power developed by the brake	30.57 h.p.
Coal consumed 100 h.p.	59 lb. per hour
Coal per horse power per hour	2.3 h.p.
Consumption water per horse power per hour	45.2 gals.
Water evaporated per square foot of boiler	8.4 lb.
Ratio of output to indicated horse power	.857

The fuel employed at this trial was briquettes of Anzin. A similar trial carried out with an engine developing 67 horse power on the brake gave somewhat better results, the ratio of useful to indicated horse power being .872, and the water evaporated 8.61 pounds of water per pound of coal.

The engine of MM. Chaliguy and Co. has been employed during the whole term of the Exhibition in driving dynamo-electric machines. In this case as well as in several others indicated in this course of description, the steam made at one place is used in the general plan on page 235, etc. At the commencement of the machine, the two former have Watson and two Maxims. The two former have now been replaced by two other Maxims. The four machines of the latter type are arranged as shown in the annexed sketch. Of these four machines an auxiliary is the three others.

been ordered from the Silvertown Company for their use. The system combines a number of advantages over gutta-percha and has evidently a preponderant edge before it. It is more durable, repairs from electrical contact, besides offering less retardation to fast-speed telegraphing. As compared with overhead lines it is free from injury due to weather, changes of the temperature of animals and men. Moreover, it is safer to life and limb in large cities than house-top wires, and for telephonic work especially, it has the merit of silencing those obtrusive sounds due to the induction of neighboring circuits.

## NOTES.

## UNIVERSITY COLLEGE.

THE coming session of the University College will be opened on the 4th of October (Thursday next), at 3 p.m., by an introductory address to the Arts and Science Faculties. This address will be delivered by Professor the Reverend T. G. Bonney, M.A., F.R.S., and its subject will be "A Chapter in the History of the University." The title is a taking one, and doubtless the address will be full of interest to all those interested in the growth of the English University system. It should be mentioned that the lecture is open to the public without the formality of admission ticket, and free of charge. The real business of the session commences the following day. Probably from time to time during the coming season we shall have occasion to refer to the excellent work done by the University College; inasmuch as we may make a special feature of the session, a series of ten lectures in "Steam Motors," by Professor Alexander H. Kennedy. The first of these lectures, which will be given free of charge, is set down for the 11th of October, and on each succeeding Tuesday at 8 p.m. All the special facilities afforded for exceptional work in the engineering laboratory must also be mentioned. Young men whose opportunities do not enable them to enjoy the advantages of the various series of lectures given in the College, can nevertheless make use of the laboratory to facilitate their studies in any particular branch of investigation they are pursuing. The privilege of using the laboratory is given to all persons, whether students or not, who, by the University, are so enabled to acquire special knowledge that would otherwise be denied them.

## THE MASON SCIENTIFIC COLLEGE.

The winter term of the Mason Science College, Wigan, commences on Monday next, and its Civil and Mechanical Engineering Section will present greater advantages to the student than heretofore on account of the increased facilities that have been and are being added. The whole range of study extends over three years, one year of which may be taken by a student properly prepared, though of course the benefits attendant to the whole series are much greater. The first year includes pure and applied mathematics, chemical lectures and laboratory practice, physical lectures and laboratory practice, engineering classes, workshop on measuring and drawing instruments, practical methods of calculation, and tools and machinery. The second year's programme is on the same lines, but of course takes the student further, while in the third year three lectures are given in each of the five main classes, into which each course is divided for the sake of convenience: electric engineering, mechanical engineering, mining, civil engineering, and metallurgy. The action is to be furnished with a lecture hall, a large room for drawing classes, a museum of illustrative models and specimens, a laboratory for testing materials, a workshop, and an experimental steam boiler. The total cost of fitting up the various parts of this section will be about 4000, and this will be done by successive grants, the amount of which will depend on the success obtained. As we have stated before, the professor of engineering is Mr. Robert H. Smith.

## THE EDISON EXHIBIT AT THE PALM DE L'EXPOSITION.

A week or two since, in commenting on the telegraph exhibits at the Paris Electrical Exhibition, we stated that one of the instruments made most conspicuous by a lustrous label was the "simplest and most perfect" telegraph instrument in the whole Exhibition. "We have since found that this statement was made in error

which arose in the following manner. The instrument in question, although shown in Mr. Edison's collection, is not wholly his, but is, we understand, the invention of Mr. P. Konny, subsequently improved and developed by Mr. Edison. It is an autographic telegraph, in which the message to be transmitted is written with a hard pencil on soft paper. This paper, with the almost microscopic impression produced on it by the pencil, is placed around a transmissive drum, which is set in motion, the paper being in contact with an extremely fine pointer in electrical communication with the pointer of the receiving instrument at the other end of the line. This latter instrument has a drum on which chemically prepared paper is placed, and the second pointer receiving its movement from the first, reproduces a fac-simile of the written message. The instrument is one of extreme beauty and simplicity, and we shall shortly illustrate and describe it fully. Such a novelty naturally attracts much attention, and the experimental messages written by visitors are very numerous. It happened that the writer of the criticism we have referred to above, had noticed one of the messages, and supposed that Mr. Edison was responsible for what the very original and spontaneous expression of opinion on the part of no appreciative visitor. We hasten to make this explanation which we feel is due to Mr. Edison and Mr. Konny.

**ELECTRIC LIGHTING AT SOUTH KENSINGTON.**  
On our last issue of the 19th inst. we published a report by Lieutenant-Colonel Festing, the Assistant Director of the South Kensington Museum, on the use of the electric light in a part of the Museum. This report appears somewhat tardily, as it deals only with the experiments gained up to December last. The immediate reason of postponing the report was the fact that Sir Frederick Leighton's mural painting in the Lord's Prayer Chapel might be injured with gas. The installation on the Hrusk system was first made in March, 1880, when eight lamps fed by a gas engine illuminated one-half the court, and the following June the number of lamps was doubled and the whole court was lighted. Between June and December three dozen lamps were burnt on 87 nights for a total of 369 hours. The cost of installation was £204, the gas consumed was 29,248 cu. ft., and the electricity supply twice the number of lamps, and for this reason Colonel Festing assumes the first cost at £1040. The expenses of lighting during the six months period were £99, 2s. 6d., or 10s. 10d. per hour of lighting. The gas which it replaced cost 1s. per hour, or 2877 1/2s. for the same period, so that the saving effected by the use of the Hrusk light was 211s. or at the rate of £20, 10s. per hour of lighting. The economy would be really somewhat less than this, as the depreciation of plant has to be taken into consideration, but making full allowance for this, the saving effected is very remarkable. And this is not the only advantage; so far as regards the quality of light produced, visitors to the Museum are thankful for themselves, while the kind state of the air, the effect of gas is entirely removed, and there is no possibility of injuring the decorations or the contents of the building. It may be of interest to remark that the Luss Gas lamps are not in regular use in the Library at the Museum, and appear to give satisfaction. So far as we know this report of Colonel Festing contains the first official statement as to the comparative cost of electric and gas lighting, and the Anglo-American Company may be congratulated in having secured such powerful evidence as to the efficiency and economy of their system.

**RAILWAY TRAFFIC REVENUE.**  
Now that one-half of the railway half-year is over, it is worth while glancing at the traffic returns, so far as they are presented. Their general bearing on the cost of the most favorable that has yet been presented of recent years. All the great ways have in the past few months very materially increased their returns over those for the corresponding periods of the past year. In the case of the four great railways of the London and North-Western, Great Western, Midland, and North-Eastern there are increases for the three months of from 1000 to 5000 each; and when to this general increase is added the slightly smaller increase which nearly every line in England shows, it is apparent that there are all the indications of a general and steady increase in the mileage traffic of the country. Small lines whose traffic is chiefly

passengers, such as the Metropolitan, show it as well as the great lines, and it is marked in all districts of the country unless it be the purely agricultural. An analysis of the increase shows that speaking generally it arises in all the great departments of railway revenue, and hence it is the more gratifying. Such an increase, so spread over minerals and goods and passengers, and derived from the great bulk of the contributory districts, is the best indication that we can have of an improvement in the trade of the country, for the traffic receipts of our railways are the best barometers of the great trade. And that increase is the more satisfactory when it is borne in mind that it is an increase on an increase. A year ago the great railways were benefitting from the extraordinary activity in the mineral trades, and it is the woe of the times that lines that are now being enlarged upon. In the returns that one or two of the railways give only, there is proof that on these the increase of traffic is with only a very small increase on the working expenses of the railways, and if this is the case generally it may be said that the prospect is one that promises well to the railway shareholder. If it were not for the enlargement of the capital, there would be a general increase of the traffic, and it is not in that part at least of the additions to capital are in the light of a good policy, for there can be no doubt that in an early future Parliamentary requirements will be greater for our railways, possibly in the direction of compelling a separation between goods and passenger traffic.

**TECHNICAL INSTRUCTION IN THE WIGAN DISTRICT.**  
For twenty-three years an institution has existed at Wigan, established for the purpose of affording technical instruction in all matters appertaining to mining and mechanical engineering and iron and steel manufacture. The Wigan Mining and Mechanical School is associated with the Science and Art Department at South Kensington, and with the City and Guilds of London Institute for the Advancement of Technical Education. A separate section is devoted to instructing persons who, actually hold, or intend to acquire, for many years' certificates of competency; and so much success has attended the work of this section that nearly all the collieries engaged in the Lancashire coalfield have at one time or another attended the instruction. An important feature in the course of instruction is the visits which the students undertake during the session to various works. And so much more than sixteen separate visits were made, extending over an afternoon, and included blast furnaces, forges, rolling mills, Bessemer steel works, rollers above and below ground, engineering establishments, corn mills, paper mills, and printing offices. This year the terms of Warrington has thought well to follow in the wake of its neighbors, and at a successful management meeting, a week ago, classes were formed to give technical instruction in applied mechanics, iron and steel manufacture, and the steam engine. Warrington contains perhaps the largest forges and rolling mills in England, and in a most appropriate course for such technical education as is mentioned above. At the Wigan Grammar School also an engineering section has been established which meets every Saturday, thus not interfering with the regular work of the school. Instruction is given in mechanical drawing, building construction, the principles of mechanics, and the steam engine. This section is likely to have considerable success, as Saturday is the first of a series of excursions were made to several important collieries. Although technical education seems to be doing a good work in the important manufacturing and mining districts of which Wigan is the centre. As Mr. Hall, a moderate member of a meeting the other day said, persons intending to become engineers either mining or mechanical, do not go to the Wigan schools, but to the works, have facilities in these classes and excursions for fitting themselves for good positions, not possessed by many districts of the kingdom. Nearly every important engineering establishment represented in this neighborhood either in Wigan, or Bolton, or Warrington, and the proprietors and managers display commendable willingness to assist students having a thirst for technical education.

## REDUCED PRODUCTION OF IRON.

The reduction of the output of pig iron in Cleveland and in Scotland must be considered as the attempt of the ironmasters of those districts to deal with the question of how demand and produc-





There has fortuitously been made great changes in the general appearance of the Palais de l'Industrie, and the Exhibition is now settling down to a sort of order which in some way compensates for the still very incomplete state of that section of it which will probably prove the most attractive to the public. It is certainly unequal for practical and commercial importance, namely the electric light. It is the backward condition of this important that now alone delays the opening of the Exhibition in the evening, for it would obviously be useless to admit the public after dark when only a small proportion of the electric lights can be in action, far there is no other source of illumination provided. We fear that the English and American exhibitors must, assuming a considerable proportion of the responsibility of the delay, for but very few of the British and American engines are ready to work, and none have not yet arrived within the building. The Gramme and Jablochkoff installations have been making trial runs, as have the Gramme exhibits of Messrs. Siemens and Halske. The great Irish machine was tried on the beginning of the week, and the rest of the exhibits of the Anglo-American Electric Light Corporation will be completed in a few days. The main collection appears to be almost as backward as ever, and it must be some considerable time before the public will have an opportunity of judging the merits of the Edison lights, for the generators are not yet in their places, neither are the engines ready to be worked.

The Paris Electric Exhibition of 1881 will always be marked in the history of the development of electric science by the number of electric lighting systems complete or in part which are being exhibited for the general public for the first time, or at all events have not been known before the well-known systems, such as the Gramme, Siemens, Swan, Brush, and others, are no fully represented in the Exhibition in many respects in form, that an element of novelty is to be found in almost all the exhibits of these systems with which the public will be made acquainted. We have already referred to the dynamo-electric machine of M. Jablochkoff, which is exhibited by the Société Générale d'Electricité, and which we shall describe shortly. Not far from the Jablochkoff pavilion is an example of the Schuckert machine which is now ready for work. This apparatus may be looked upon as a modification in general principle of the Gramme machine, the armature consisting of a flat iron ring running within a narrow magnetic field produced by four electro-magnetic magnets, which are included in the main circuit of the machine. The pole-pieces of this machine consist of flat rectangular plates, these plates being parallel to the axis of the ring and perpendicular to the axis on which it rotates, and it is this disposition of the magnetic field with respect to the armature ring which constitutes the principal difference between the Schuckert and the Gramme machines, for while the currents in the latter are induced in the circumferential convolutions of the armature coils, the principal currents in the Schuckert machine is in the radial portions of the coils, and which form the flat sides of the armature ring. The cylindrical Gramme armature, running in a cylindrical field, is subject to circumferential induction, while the also armature of Mr. Schuckert, moving in a flat field, generates its current by lateral induction. In the British Section Messrs. Rowatt and Fyfe exhibit in action two sizes of Schuckert machines, the one capable of illuminating three arc lights and the other two. They are now working with the Pöten lamps and Joule batteries. The current from the Schuckert machine is of very high electromotive force, and in consequence the generator may be used at a considerable distance from the lamps or the lamps from one another; this in special installations is of advantage, but on the other hand the customer requires not only a careful insulation but also very careful handling, as the shock from such a machine would be of a very painful character. Messrs. Rowatt and Fyfe also exhibit lamps and cell canals working in connection with both Gramme and Siemens machines.

One of the greatest novelties of the Paris Exhibition is the dynamo-electric machine of Dr. Hopkinson, of F.R.S.E., which has been constructed by Messrs. Latimer Clark, Munroe and Co. This machine will be represented in two forms (only one is at present unpacked), the one for the production of continuous and the other for alternating currents. Dr. Hopkinson's dynamo-machine—which we hope to illustrate on an early occasion—while being extremely compact, is of the most extraordinary construction of all electric generators, and as we may assume from Dr. Hopkinson's well-known reputation that his principle is correct, we may look upon this apparatus as one of the most interesting in the Exhibition. In cast-iron cylinder about 30 in. in diameter, and about the same length, with a shaft rising to the axis by means of a pulley on one end and having inside the cylindrical surface a number of oval openings or slots, through which the magnets and the armature can be seen. The magnetic field is produced by twenty radial electro-magnets of not-alapier cross section arranged in two sets of ten around the axis of the machine, the free ends of the

not being presented towards the free ends of the corresponding set, as in the Siemens alternate current and Wild's machines. Between these two sets of magnets, and within the magnetic field produced by them, runs a disc of iron, from the opposite faces of which project respectively ten notched-shaped levers corresponding in position around the axis with the ends of the electro-magnet, but not more than about 1 in. in depth. Around these levers are wound coils of insulated copper wire, which are connected to a cylindrical commutator of the form adopted in the Gramme and Siemens machines. The peculiarity of Dr. Hopkinson's armature lies in the fact that the projections or armature cores on the opposite sides of the disc are not co-axial, but overlap one another, those on one side being in advance of those on the other by a space equal to half the distance of their centres apart, and thus when one bobbin on one side of the disc is also in advance with one pair of magnets, two bobbins on the opposite side are half in and half out of the magnetic field, the one leaving it while the other is entering. By coupling up the machine in various ways, various conditions of currents can be obtained; but two distinct machines will be exhibited by Messrs. Latimer Clark, Munroe, and Co., the one generating alternating currents and the other for continuous currents. The same form exhibits also an electrical light designed by Dr. Hopkinson, which has many special features of interest and novelty.

In the section devoted to the United States there are exhibited by the proprietors of the Whitehead Mills, Haverhill, Mass., a very interesting dynamo-electric machine which, while being almost identical in general principle with the Siemens alternate current machine, is of a very novel construction, and it, moreover, excites its own field magnet, which the Siemens machine does not. In this manner being parallel to the axis of the "Arago disc dynamo" has been conferred by its patentees, Messrs. Seely and Talbot, the magnetic field is produced by two sets of six cylindrical electro-magnetic magnets arranged as in the Siemens machine above alluded to, in two rows, the free ends of one being directed towards the other, and the other ends are enclosed with flat notched-shaped pole-pieces. These magnets, like those in the Wild machine, are so wound that their polarities alternate around the circle, and the opposite poles of the two rows are presented towards one another. Within the magnetic field thus produced is rotated a thin disc carrying six sector-shaped coils, which are all wound in one direction, but are as connected up that a current traversing them in series would circulate through them in opposite directions. There are no magnets in contact with the disc, the control space within the coils being fitted up with wood. Of the six bobbins four are set apart for exciting the field magnets, and the other two are connected to the external circuit of the machine, the remaining four bobbins supplying the useful current. This method of exciting the magnets is a novel one, and is the work of two commutators and sets of brushes, the one connecting the magnets with the exciting coils and the other between the induction coils and the external circuit, and the brushes are fixed upon a frame which can be rotated through a certain angle by means of a screw on the machine.

Maxim's and Weston Machines, so as to adjust the position of the brushes with respect to the magnetic field, to their positions of the magnets. These two machines are exhibited in two sizes, and are intended to be worked together on one circuit, that is to say, the positive terminal of the first machine is connected to the negative terminal of the second, the remaining terminals of the two machines being in connection with the lamp circuit. It is stated by the proprietor of this very interesting apparatus that the two machines so arranged will maintain in series eight arc lights of apparatus of two thousand candle power.

It is stated that the inventor of the "Hall" machine working alone can supply four lights in series of 1800 candle power. The lamp type of the machine is the one known as the Hall regulator, being the invention of Mr. Clinton M. Hall, of New York.

The Comptoir International d'Éclairage par l'Électricité, with which is now exhibited the old-established Société d'Alliance, exhibit in action a number of specimens of the dynamo-machine, of four examples of the very beautiful machines of

Mr. Wildo, of Manchester, for whose apparatus the Comptoir International hold the patent rights for France, Belgium, and the United States. Mr. Wildo has been largely employed in the British Navy for electric lights as a defective and offensive accessory to torpedo warfare, is in general appearance very similar to the Siemens alternate current machine, but it differs from it in two essential particulars. In the first place, the induction bobbins of Mr. Wildo's machine are fitted with two cores, which are absent in the Siemens machine; and in the second, the Wildo machine is dynamo-electric, one of its bobbins being set apart for exciting its field magnets, and is consequently required no separate generator for that purpose. What, however, several machines are being worked in the same installation, Mr. Wildo prefers to excite the magnets of all the machines by the current from a separate machine, which in this case the six induction bobbins of each machine are all contributing to the main current instead of five only, as is the case when a bobbin in each machine is set apart for exciting the electro-magnets. Another special advantage of the Wildo machine is that by changing the commutators the machine can be arranged to transmit into the external circuit either a continuous or an alternate current. There are on this machine, as on the American apparatus alluded to above, two commutators, one for connecting the magnet below with the exciting bobbin, and the other for connecting the magnet with the armature in connection with the external circuit. The larger machine, driven at a velocity of 1200 revolutions per minute, will supply the currents to from six to eight Wildo machines, and the smaller machine, running at the same speed, is capable of maintaining three Wildo machines.

The Comptoir International also exhibit apparatus for electro-plating and for the transmission of power, as well as an interesting collection of Wildo candles, and many other very apparatus, and a large number of the electric light. The new grand staircase at the west end of the building is illuminated by the Wildo candles, which we shall illustrate with the pictures in the course of the next series of articles, and there are several other lights belonging to the same system distributed throughout the Exhibition.

There are some other interesting machines in an interesting dynamo-electric machine constructed by the inventor, Mr. R. J. Gillest, of Bolo (Sicilia). In this machine the magnetic field is produced by 8 horizontal electro-magnets of oval section arranged in two sets of four, their free ends being directed towards one another and attached at their opposite ends to two vertical circular frames carrying at their centres the leverages in which the main shaft of the machine runs; the opposite ends of each pair of magnets are connected together by a U-shaped pole-piece, the open jaw of which is directed towards the centre of the armature ring. Between two sets of magnets and within the pole-pieces is rotated a flat ring armature, the coils of which are wound Gramme fashion, but with spaces between the coils, and the magnets are connected to Mr. Gillest's machine couples in principle as intermediate position between the Gramme and the Schuckert machines, as the pole-pieces are not between the internal, but in the circumferential convolutions of the armature hollow. The commutator is of the Gramme type, but the magnets are connected to the armature. It is, however, of extraordinary length, consequently requiring cooling by water, and is provided with a very perfect electrical contact is assured, and the clings of the magnets are so arranged that the magnets are "sprung" are released. A large number of the magnets are wound with a double strand of copper wire, consisting of two thick wires, which are held in a thin coil of efficiency can be obtained, and the value of winding, but there must be a considerable number of turns of the exciting circuit in order to obtain the necessary current. It is in this machine the electric current is transmitted in a form perpendicular to the axis of the magnets, and is so arranged that the magnets are coupled.

Mr. Gillest exhibits a series of twelve arc lamps, which are worked by the current from the apparatus which is magnetically controlled by the magnets of the machine. The apparatus is of the type of the Comptoir International d'Éclairage par l'Électricité, with which is now exhibited the old-established Société d'Alliance, exhibit in action a number of specimens of the dynamo-machine, of four examples of the very beautiful machines of





lighting: 16 Wörldehman lamps in the subscribers' gallery; 16 Jachtschiff candles in the loggia; 72 of the same in the auditorium, and four Jaspur semaphores in the buffet.

## WEDDEMANN •

The subscribers' gallery is a circular room, with a low ceiling generally lit by 20 gas jets spaced around the wall. These have been replaced by 16 Wiedemann lamps in a crystal chandelier suspended from the centre of the ceiling. These lamps judiciously slanted, form round the

## Swan

## JAVLOCHKOFF.

[illegible]

**Датум:**

[illegible]

and will have an average luminous intensity of about 4000 candles.

[illegible]

To the representative of the Edison incandescent system has been entrusted the illumination of the grand foyer or saloon, which is probably the most beautiful feature of M. Garnier's building. This well-proportioned and elaborately decorated saloon is illuminated by ten chandeliers suspended from the ceiling, each carrying forty-eight Edison lamps of the smaller size known as half lamps, possessing half the resistance, and giving half the light of those known as the whole lamps. The half lamps have the same intensity of about eight candles each. At each corner of the room are two grand cases, each supporting a mirror and a large statue.

OCT. 21, 1881.]

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arrangement is one of the specialties of the Edison system.

All the machines are driven revolutions per minute by a 25-horse-power semi-portable engine, but of course to much higher power, each of which, we are told, shows more efficiency in light than of about 100, i. e., of 16-candle power each per candle. The first of the new lamps is the Bathelet, which is shown by the Editor at the Exhibition, informed that Mr. Ballan has lately so far improved his lamp, that he is able to use "his lamp," or rather over nine "watts per square foot."

The average resistance of lights is, when at their normal value, that of the 135 ohms, that of the "half" that the whole resistance of the connected up as they are, is the "whole lamps" in parallel circuit. .45 ohms, so that the lamps in question offer a resistance altogether half an ohm.

MAXIM.

The Maxim system of lighting

la applied to the two little stained glass windows in the entrance of the grand foyer, in which are placed. In each of these cancellabres, each supporting all or seventy-six in the whole seventy-six lamps are supplied currents by two Maxin machines exciting, such as we described the apparatus being driven by engines by Messrs. Garrett, of temporary shed erected against the wall of the Opera House or transact of the Opera House.

The various installations are completed, but in a few days all installation will be out work. Great gain gives at the Opera, the Electrical Congress and the Ministère des Postes et des Télégraphes at work was to French the grand staircase with remarks was, it is true, an apology for induced by the Maxim lamps, but vastly superior illuminating power lamps. This was not, however, for a Maxim machine.

light being produced by a ver-  
of Faura accumulators, and t  
before the installation was c  
be before rival incandescence a  
sentatives were sensible enou  
arrangements before exhibitio  
nothing less than a failure.  
Maxim lights were fully work  
Tuesday night, a very much b

THE LARGE EDISON  
TRICAL MACHINE

**EXHIBITION OF ELECTRICITY.**  
 AFTER a number of delays great electrical machines from Mather and Platt have been fixed in its place in the Electric Building, and it is expected that they will be seen at the exhibition. This is illustrated on page 409 of our issue of the 10th inst. and undoubtedly the most dynamic of the machines that have been constructed in the United States. It is placed in the Electric Building in New York, and few which install underground conductors are being used to supply the current to the various houses and warehouses of the city, and finally to light the street.

The complete apparatus consists of an engine of 185 horse power, a centrifugal pump, a large electric machine of enormous capacity, all of which are attached to one bedplate or foundation. Some idea of its size may be obtained from the fact that the whole weighs less than 17 tons, of which 10 tons are field magnets alone, and the rest is made up of iron upwards of 2½ tons. The electric machine is coupled together by a pair of pinions with that of the engine.

ENGINEER

distinctive features that adopted by Brotherhood, all  
dispensed with, and the sudden ce

[illegible]

The Edison "whole arminal incandescence light" being 075, or 039 "half lamps," the same as that of 316 ohms, is that of  $\frac{135 \text{ ohms}}{316}$ .

rooms, one at each of the Edison lamps little more than a position of the lines of force with respect to the neutral plane is not too hard to produce and can hardly think such a form of repeated in future machines.

With their electric and one regulated, the great loss in our last volume, a two-hour power maximum, in a the western rotunda

unusual distribution of the force with respect to the neutral plane is not too hard to produce and can hardly think such a form of repeated in future machines.

With their electric and one regulated, the great loss in our last volume, a two-hour power maximum, in a the western rotunda

from being com-  
the lights of each  
on the occasion of  
on Saturday last  
electrolines by the  
telegraphs, the only  
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possibly to exist. Then  
or a light being pro-  
out only to show the  
power of the ordinary  
however, the Maxim  
were, usually, the  
the machine at the expense  
inclined to think that but very  
added to the magnetic field by  
that half length of the magne-  
come from the pole-pieces, and  
cient is inductive effects on the ar-  
rate for the greatly increased  
necessary for their construction.  
The armature of Mr. Edison's  
the most interesting and impec-  
torious of the apparatus. It is  
to the Siemens direct-current ty-

ing up is very different and more than that of the Grammo caecabio, cylindrical form and revolves revolutiona per minuto in a hollow by the interior surfaces of the pieces to which the magnets are in a wire used in its construction portion of the armature being made of straight copper bars or prisms

driving belts are attached, it follows that the line of junction of the light the jaws and the disc.

[illegible]

fixed in a bell form a shunt, or a result of the machine. It is attached to the axle ahead them to the construction it is to be regarded, to the apparatus, for the addition. It is already been added to the construction, probably on producing as strong as possible to the. The

side magnets with the magnetic field, asymmetrical distribution in the field, and no construction will be required to connect the electronic devices to the ends of the field with insulated wires that they are clamped on working, and that the construction of the lamps will be carried out across each of which is stretched a trellis to which are suspended the lamps. There will be 25 lamps on each frame, or 250 lamps in all. In addition to these the staircase will be illuminated by 113 lights attached to the central chandelier, a total of 398 whole lamps.

There will be a further number of working in the rooms devoted to the Edison and a number of other lights will be used, the same current in various buildings.

The conductors are solid rods supported in cross section and embedded in concrete.

iron, but we are  
 little magnetism is  
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 which is more  
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 ciently to compen-  
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 which is laid across the induction  
 these conductors are of the form and  
 in the large main conductors which  
 part of the Edison installation in New York  
 "The resistance of the armature of the  
 is almost inconsiderable, being only .003  
 while that of the magnet coils which form  
 direct to that of the armature is 30 ohms  
 calculated that the resistance of the external  
 where all the lamps are at work will be  
 an ohm, or fifty times that of the armature

It will be interesting to see how the  
method is verified in actual working in the  
future. We have no doubt that some very valuable  
results will be made of this unique and  
apparatus, the results of which we shall  
much interest.

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NOTES.

THE TRANSPORT OF FROZEN F

in the We

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THE SCOTCH FISHERY DEPARTMENT has received information from the fishing boats of the Scotch Fishery Board that 141 boats, 515 or more of the largest fishing boats in Scotland, manned by 1,414 men and hardest-working fishermen, were wrecked and lost property in three islands, were wrecked and lost property within sight of their own houses and were whirled out to sea and abandoned to waves.

• See ENGINEERING, vol. XXIV, page 1021.

exciting the field magnets of the other six, whilst thus may be looked upon as magneto-electric machines. The six lighting machines are connected to the exciting machine in parallel circuit, that is to say, a separate pair of wires leads from the terminals of the excitor to the magnet coils of each of the lighting machines; each of the latter feeds into the main circuit, so that the machines are disposed with respect to the conductors at one end, in precisely the same manner as are the pairs of lamps of

electric machine of enormous size, attached to one bedplate and another machine. Some idea of its size may be obtained from the fact that the whole machine weighs less than 17 tons, of which 12 tons are the field magnets alone, and the rest the armature upwards of 2½ tons. The armature is co-axial with that of the motor, and the two are coupled together by a pair of pinions forming a link between them. By this

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via drums and a dra  
in an arrangement, as in

Many corroborations were needed of our expressed opinion of the necessity for the abolition of the Scotch Fishery Buoys, and the supply of the calamitous disaster has been supplied by the melancholy catastrophe of 14th last. Fifty or sixty of the largest fishing boats in Scotland, manned by some of the stoutest and hardest-working fishermen in the country, were wrecked and lost on the rocks and shoals of the Firth of Clyde, within sight of their own homes. Those who were not lost out to sea and attempted to

## MECHANICAL REFRIGERATION.

By J. K. KILBOURN.

It is now about twenty years since Ferdinand Carré of France, protector of the ammonia patent, first used ammonia as a frigorific medium. Since then, Carré of Leiden, Mort and Nicolle of Sydney, Australia, have spent time and money without stint to investigate and experiment with ammonia, and have patented various improvements and modifications of the Carré system. More recently Professor Ludov. de Gorny has brought out an ammonia machine upon a different system.

For classification, the Carré and Recce systems represent what may be termed the absorption method, while Lindé's arrangement may be described as the compression system, or more strictly defined mechanical compression.\*

In general terms, ammonia may be described as a highly volatile condensable gas, having a boiling point of 30 deg. minus, at atmospheric pressure—a vapor tension of 120 lb. at 65 deg. Fahrenheit—a specific gravity of liquid of .704 at a temperature of 40 deg.—a specific gravity of vapor of .52 (air being one)—and by equal weight a latent heat of 900. It is slightly inflammable, and exceedingly irritating to the respiratory organs.

With ammonia, as with all the condensable gases, cooling is effected by its vaporization, the heat necessary to cause this change of state being abstracted from whatever substance is at the time in contact with the vessel or pipes containing the gas.

The heat so absorbed is termed "the latent heat of vaporization," and if at this point the gas with its condensed heat could be sent to waste, cooling would be a simple matter; but unfortunately, ammonia is not "free as air," and to hold it in all times and places, consequently it must be re-condensed over again. To do this the vapor must be re-compressed, and this necessitates cooling and pressure combined. Provision for these requisites brings us to the diverging and divergent systems under discussion, both leading to one result, viz., returning the gas to the starting-point.

We will describe the two methods, and first the "absorption" plan.

The different appliances for carrying out the absorption system, are—

1st. A boiler in which the ammoniacal liquor (commercial ammonia) is distilled, either by the application of heat direct to the surface of the boiler, or more usually by steam circulating through pipes within the boiler.

2nd. A condenser and liquefier, which is a vessel containing coils of pipes, terminating at their lower extremity, in a receptacle for the liquid, when re-formed.

3rd. A refrigerator, also a vessel containing pipes or coils, terminating in a closed receptacle at the bottom.

4th. The absorber, a closed vessel, one side of which is connected by a pipe, to the series of pipes before mentioned in the refrigerator. Whist from the opposite side a pipe leads to the boiler.

5th. Appliances or condenser number two, which is usually an open top vessel filled with pipes.

6th. One or more force pumps, between the last named condenser, and the boiler from which our description starts.

In ammonia machines of this class, and of any similar kind, the working is continuous; but the process will perhaps be more clearly understood if described in its several stages.

Ammoniacal liquor or commercial ammonia of standard strength (specific gravity .885, contains (by weight) about 30 per cent. of water, and at 65 deg. minus, the boiling point of this strength is at atmospheric pressure, according to Dalton, is 65 deg. (Fahrenheit's scale).

For convenience to calculation, we will assume that the boiler is charged with 100 lb. of ammonia—of the standard strength (885), and at a temperature of 100 deg. We will also assume, that it is in accordance with modern practice, that the boiler contains pipes, and that a current of steam circulating through these pipes, so applied will first raise the temperature of the liquor to the boiling point, which is constantly varying between 65 deg. and 180 deg. at standard pressure, according to the strength of the

remaining liquor, but is at all times below that of water at same pressure.

A continued supply of heat over the liquor has reached its boiling point causes a rapid vaporization of the ammonia, and a lesser passing off of the water vapor. The combined vapors are condensed by a pipe to the top of the coils in the condenser. In these coils the vapors accumulate, until the pressure derived from this accumulation causes its liquefaction. The resultant liquid finds a lodgment in the receptacle at the termination of the coils.

We will assume that the vaporization continues until what remains of the ammoniacal liquor has a specific gravity of .075, and at this gravity it would have 5 per cent. ammonia and 95 per cent. water.

Assuming also that all the vapor has passed over to the condenser, then, according to Recce, we shall find in the liquefier 35 lb. of residual liquor—water, and in the boiler 65 lb. of weak liquor, which is 95 per cent. water and 5 per cent. ammonia.

From the 100 lb. of commercial ammonia at the outset, we now have 35 lb. of concentrated ammoniacal liquor in the bottom of the condenser, and if the condensing water had a temperature of about 125 lb. per square inch.

This pressure is termed the liquefying pressure, and it is to the pressure at which the gas would liquefy at the temperature of the condensing water. But it may be noted that the gas does not actually until the sensible heat of the gas, and the latent heat of vaporization, have been absorbed by the condensing water.

Having now by heat caused the vaporization of the greater portion of the ammonia, and a lesser portion of the water, and also, by cooling and pressure combined, caused its liquefaction, we may with this concentrated solution proceed to the third stage of the process, in other words, the old process of re-compression, for which all the others may be considered as subsidiary.

If the concentrated liquor in the liquefier under pressure be conducted into the refrigerator, and there be allowed to expand, it will again assume the gaseous form.

This second vaporization, like the first, is also caused by heat; but owing to the concentration of the ammonia strength, the boiling point has been lowered to at least 55 deg. below freezing, consequently ice, or any substance lower in temperature than ice, but above this boiling point, will furnish the heat necessary for vaporization, and whatever substance parts with its heat, to cause this vaporization, must of necessity grow colder.

If this substance, which is analogous to the steam, justifies its temperature below the boiling point of the ammoniacal liquor.

Of this boiling point it may be said, that it ranges between 30 deg. minus, for pure anhydrous ammonia, to 75 deg. for 5 per cent. strength, varying between these points according to the percentage of ammonia in the solution.

As, according to Dalton, the boiling point of anhydrous ammonia liquefied contains 35 per cent. of water, and of this weight of anhydrous ammonia is 30 deg. it will be evident that vaporization will cease when the liquor is reduced to this strength, and when this substance that supplies the heat is cooled to this point, and our object of ice-making, a temperature of 27 deg. minus, is slightly effected.

In review of this stage, it will be remembered that we started with 30 lb. of concentrated ammoniacal liquor, containing 75 per cent. of its weight of ammonia, and we will assume that the second vaporization has continued until this liquor of 75 per cent. strength is reduced to 35 per cent., which, as has been shown, is the limit of practical result in ice making. We shall now find in the bottom of the refrigerator 14 lb. (nearly) of ammonia, which would contain 6 lb. of ammonia and 9 lb. of water. It will be seen that of the 30 lb. ammonia and 70 lb. of water with which we started, 27 lb. of ammonia and 5 lb. of water have been vaporized, and re-liquefied in the first condenser. This 30 lb. of concentrated liquor has been passed into the refrigerator; but inasmuch as the second vaporization is effected at a temperature below that of the ammonia in the boiler, of a stated strength has been re-vaporized, consequently we have in the bottom of the refrigerator,

of the ammoniacal liquor vaporized in the boiler, 5 lb. of ammonia and 9 lb. of water which is useless for effective work.

It may be remarked here that Recce's improvements had for their object the expansion of the ammonia and aqueous vapour to the first condenser, and the return of this water so collected to the boiler. In this he was to a certain extent successful, but the way has not been discovered of producing anhydrous ammonia by the absorption system—or can it in reason be expected, with the constantly repeated vaporizations. At high temperatures aqueous vapour will always pass over, and it is scarcely possible that the two vapours so nearly equal in latent heat can be perfectly separated, nor has it been done.

In every ammonia machine working on the absorption plan, there is a constantly increasing accumulation in the bottom of the refrigerator of what the workmen call "bad stuff," and which from time to time must be withdrawn, or returned to the boiler.

This accumulation seriously affects regular production; the machine giving maximum results only after every withdrawal, and decreasing as this "bad stuff" accumulates.

To return from our digression—if our object had been to test the cooling power of vaporizing 22 lb. of anhydrous ammonia, we should allow the gas charges with the latent heat of vaporization to escape from the refrigerator into the open, after cooling it to the initial temperature of the cooling medium, and our experiment would now be concluded; but as we undertook to describe the absorption system, we have at this point arrived at the stage where the distinctive features of the system are manifested.

It should be noted, that in this description of the process by stages, we treat each stage as if it were entirely complete before the next begins; in point of fact, there is no such thing as a stage being complete for instance the rapid vaporization would not be instantaneous even in pressure, where there is vaporization, the gas would accumulate until the vaporization ceased. This withdrawal is the commencement of the fourth stage.

(To be continued.)

## TELEGRAPHY AT THE PARIS ELECTRICAL EXHIBITION.—No. IV.

GARDINER'S SHUNT METER.

In testing the insulation resistances of submarine cables or other limited conductors as well as the porcelain insulators used on aerial lines by means of the galvanometer, it is frequently necessary to ascertain the "multiplying power" of the shunt used to diminish the deflection of the battery current through that instrument. To get it is somewhat tedious calculation has to be performed, and any plan for obtaining the loss of time involved in the process is a valuable gain to the electrician. Fifteenth practical electricity and experimentalists have in general gone through the calculation without any attempt to circumvent it by a shorter method. Calculating machines have been employed in computing cable tests by Mr. P. T. Warren, at Hooper's Telegraph Works, and Mr. H. K. Kempe has suggested the use of tables for giving the multiplying power of shunts; but it has been left to an Italian electrician, Signor Cardarelli, engineer to the Technical Bureau of the Italian Telegraph Administration, Florence, to find the best solution of the difficulty.

In a pamphlet published this year at Rome, and entitled *Trattato di Calcolo Grafico*, the system of *Cardarelli*, *Derivati*, Signor Cardarelli shows a plain method of constructing curves which will give the multiplying power of a shunt, the combined resistance of the shunt and galvanometer, and the compensating resistance of the circuit by mere measurement with a scale. Since the date of publication, however, Signor Cardarelli has gone a step further, and constructed a very simple and ingenious shunt rule, so he now it is almost for the given shunt the required value in a few seconds by an easy manual operation. The shunt rule of Signor Cardarelli belongs to the class of calculating machines, though simple in themselves, are troublesome and tedious; and we believe it is the first of the kind for assisting electricians, though others probably will yet be invented for serving similar purposes, and as an invention it is therefore truly original, not the

\* Mort's patent of 1859 was an ammonia process, combining the absorption and compression systems. Recently, H. Johnson has patented a similar arrangement, but neither having yet been offered for sale, as far as is known will be made to them in this paper.









## MOTIVE POWER AT THE PARIS ELECTRICITY EXHIBITION.—No. III.

On reference to the general plan of the motive power at the Paris Electricity Exhibition which was published in a previous issue (see page 253, ante), it will be seen that opposite the group of generators supplied by MM. Noyer, is a large engine exhibited by the Société Générale des Ateliers de Construction de Paris, of which MM. Weyher and Richemond are the managers. This company has during the past five years manufactured a large number of engines for electric lighting, and the Société Générale has admitted them almost exclusively for their installations with the Jablohoff candles. We have mentioned in the previous article that the lighting of the Palais de l'Industrie in 1878, during the Session of that year, was effected by engines of 370 horse power collectively, divided into two of 100 horse power each; two of 35 horse power, and two of 35 horse power. These were supplied from the Palais Works, as well as those feeding the lights in the Hippodrome which greatly attract the visitor to Paris. MM. Weyher and Richemond have only justified the election made by the Société Générale by the excellence of design and workmanship requisite for successful electric lighting. We illustrate by Figs. 1 and 2, on the following page, the compound engines exhibited by MM. Weyher and Richemond at the Palais de l'Industrie, while Figs. 3 and 4 are a plan and elevation of the transmission and arrangement of the electric machines driven by them. The nominal power of these engines is 100 horse, but the actual power of course far exceeds this. Experiments were made with them on the 25th August last, when the question of dividing the dynamo-machines among the different motors had to be settled. During this trial, the engines ran at a speed of 70 revolutions, and with an out-off of about one-eighth, developed 145 horse power measured on the brake, and fed 60 Jablohoff candles, 33 Jamin, 25 Wedermann, 10 Soler, and 7 Debrun lamps. While the results of this trial have been officially certified we shall revert to them, meanwhile we may content ourselves with saying that it led to some modifications in the distribution of the power, which we shall refer to later on. The Weyher-Richemond engine is of the two-cylinder compound type, with intermediate condenser, and has been already partially illustrated by us (see page 319 of our third issue). The high-pressure cylinder is entirely enclosed in a steam jacket; the low-pressure cylinder is only partially jacketed, and the ends of the cylinders are left unprotected, as shown in Figs. 1 and 2 on the page just referred to. The steam used in the engine is all passed through the jacket before entering the cylinders, the pipe from the boiler being branched and entering the jacket near their lower ends, which are cast in one piece with the cylinders. The distribution of the steam in the small cylinder is effected by Farrot gear, and that for the large cylinder by an ordinary slide valve. From the high-pressure cylinder the exhaust steam escapes through a passage formed in the upper part of the jacket, and enters the valve chest of the low-pressure cylinder. From the latter it passes into the condenser, which consists of a vertical cylinder, into which the injection water is forced from the bottom towards the top in a thin conical sheet. Two air pumps, driven by a T-shaft lever lower level, are controlled by a short connecting rod attached to the piston rod of the low-pressure cylinder, remove the injection water and return it to a tank in Figs. 1 and 2. The feed pump is driven off the lower working of the air pump. The main shaft of the engine has two cranks, placed at an angle of 90 deg. and runs in two outer bearings, and a third one in the centre. The transmission pulleys are placed at one end of the shaft. The engine is controlled by a Porter governor, and the speed of the transmission adopted was also illustrated by us in Figs. 3, 4, 5, page 319, vol. III, when we published a detailed account of some experiments made for the Société de Mulsheim by M. W. Moulier and M. G. Koller, engineers to the Alsatian Association of Steam Users. In connection with this subject, however, we may briefly state the result of the results of this trial which were conducted at the mining mills of M. A. Horitz, of Colmar. It was ascertained that the consumption of moist steam per horse power measured on the dynamometer was 10.45 lb., or 18.49 lb. of dry steam, the water carried over being on an average 8.5 per cent. The con-

sumption of coal per horse power was 2.07 lb. per hour, the coal being from the Lonsdale pit and containing 15.1 per cent. of ash, reducing the quantity consumed to 2.18 lb. per horse power. These results were more recently confirmed by an eminent Alsatian engineer, M. Hollmer, who proved their correctness within 5 per cent., so that they may be assumed as absolutely exact. The engine tested at Colmar, however, was only about 70 horse power, and the one at the Exhibition being nearly three times its power, its trial is certainly greater, and may be taken as about 1.7 lb. of dry steam per horse.

If this figure be accepted, and within very narrow limits it is correct, and admitting the consumption of 1 lb. of coal for 10 lb. of steam, the engine at the Exhibition develops an effective force of 100 horse power, since it consumes 354 lb. of coal per hour. The consumption represents an expense for fuel of 3.7s. per hour with coal at 2s. a ton, the price in Paris of the Assis coal (including 5s. per ton oil duty). Oiling costs about 6d. an hour. As to the price of the motor with the boiler, foundations, &c., it may be assumed as within 2000l. Figs. 4 and 5 show how the dynamo-electric machines are connected to the intermediate shafts driven by the Weyher and Richemond engine; the arrangement is as follows:

## I. MACHINES FEEDING THE JABLOHOFF LIGHTS.

*Machine A.*—Grammo automatic exciting machine, type No. 3, with 30 lamps in four circuits; speed of machine 1830 revolutions per minute:

Circuit No. 1. Fastest and outermost .....	Lamps
" 2. Large chandelier, beside the Jablohoff stand .....	5
" 3. Street No. 11 .....	5
" 4. Jablohoff exhibit at the Western Bazaar collection .....	5

*Machine B.*—Similar type to No. 1:

Circuit No. 5. Center of buffet .....	Lights
" 6. Large chandelier at side of staircase .....	5
" 7. Postal service .....	5
" 8. Northern Bazaar collection, Christiano and Festino .....	5

*Machine C.*—Similar type, but driven at 1500 revolutions:

Circuit No. 9. Grand saloon on first floor, and lamps at the side of the Jablohoff exhibit .....	Lights
" 10. Ditto, ditto, beside the staircase .....	5
" 11. Lantern of the Collie clock and Lefevre's exhibit .....	5
" 12. Telephone, lantern at the door of the saloon of the President of the Republic .....	5

*Machine D.*—Grammo automatic exciter type No. 1, feeding four lamps as two circuits, and driven at 1830 revolutions per minute:

Circuit No. 13. Lamps placed round the lights .....	Lights
" 14. Great chandelier .....	2
" 15. Ditto, ditto .....	2

Altogether there are 65 Jablohoff lamps kept burning by the engine.

## II. LAMPS OF THE DEBRUN SYSTEM.

The Debrun system comprises a kind of boughs with parallel arches and no insulating material between them. For this work machines L and N are used. They are Grammo automatic exciters, type No. 1, each feeding 13 lamps and running at 1500 revolutions. Of these 13 lamps, 6 light the Debrun and Law exhibit, and 6 are in the exhibition section.

## III. JAMIN LAMPS.

For these, machines E and F are used. Machine F is a Grammo automatic exciter, type No. 1, with fine wire coils and running at 1830 revolutions.

Circuit No. 1. Billiard-room and passage .....	Lamps
" 2. The Jamin circuit .....	8
<i>Machine E</i> is of the same type	
Circuit No. 3. Saloon on first floor (3) and staircase (3) .....	8
" 4. Chandelier on staircase and saloon .....	10

The lamps on circuit No. 2 are in three groups of 3, 2, and 3 lights, and circuit No. 4 is also in three groups of 5, 4, and 3.

There are in all a total of 31 Jamin lights on the exhibition section.

\* For full particulars of these trials see *FORNBERGER*, vol. xxx, page 311.

IV. THE WEDERMANN SYSTEM.  
*Machine J.*—Grammo automatic exciter, type No. 2, making 1500 revolutions:

Circuit No. 1. Chandelier in middle of lights .....	Lights
" 2. Dining-room .....	12
<i>Machine H.</i> —Similar type: .....	10
Circuit No. 3. Entrance to Exhibition .....	12
" 4. Festino and Christiano .....	12
<i>Machine K.</i> —This machine, made in 40 in regular working, of Wedermann type, is driven by this engine.	

V. SOLER SYSTEM.

*Machines L and P.* The former is an alternate current machine, running at 1000 revolutions. The latter is the current driven at 950 revolutions. These are made by Luchsmeier, of Liège.

Circuit No. 1, 2, 3 were the pictures .....	Lamps
" 4, 5, 6 light the British Section .....	6
" 7, 8, 9, 10, 11, 12 light lamps .....	12

*Machines O and P* are Siemens machines for working the Soler lamp, but these are not yet in operation.

Summarizing the whole of the lamps fed by the Weyher and Richemond compound engine we have:

Jablohoff candles .....	Lights
Debrun lamps .....	14
Jamin lamps .....	31
Wedermann lamps .....	34
Soler lamps .....	12
Total .....	169

Mons. Carls Frères, engineers of Grand, were the manufacturers outside France who employed the Jablohoff system in their workshops, even from the first an active interest in its development, and it is all relating to the electric light. In 1878 they placed in their works an alternating current of 5000 volts, the voltage of the working of which they studied for six months. The observations made by them during this period were condensed into a very detailed monograph, the conclusions they arrived at were that the Jablohoff system was perfectly adapted to their requirements, and that consequently, the advantages of giving a much greater light with a smaller expenditure. As a consequence of this experience MM. Carls executed the application through the whole of their works, and as neither they were led to the construction of motors especially adapted for working dynamo-electric machines. MM. Carls applied the Jablohoff system in lighting the depot of the Antwerp Docks, as well as the Salzer engine working at the Grand Hotel, Paris, with a Mayer governor. The motor which this firm is exhibiting at the Paris Electricity Exhibition is the largest that has been supplied to the syndicate—it indicates over 150 horse power. It is a horizontal compound engine in two distinct parts; on one foundation is placed the high-pressure cylinder, not on the other the low-pressure, the condenser being in line with the latter cylinder and worked direct from it. Both engines are on one shaft with the flywheel between them. The bedplate of the engines are the ground level, and the arrangement adopted gives plenty of room for access to all parts of the mechanism. Both cylinders, as well as the cylinder cover, are steam-jacketed, the jacket being cooled with a steam-jacket, the jacket being cooled with a steam-jacket, the jacket being cooled with a steam-jacket. Steam is admitted direct from the boiler into the jacket. The valve gear is of the well-known Debrun type, which has been fully illustrated and described in our columns (see *FORNBERGER*, vol. xv, page 9 and 32). We need not, therefore, refer to it here. The design, construction, and material of the engines are excellent. The main shaft, connecting rods, piston rods, and expansion gear are of steel, and are all highly tempered; the bearings are fitted with anti-friction metal. The engine is controlled by a Porter governor, the standard type adopted by 3131. Carls.

At the time of the official trial of this engine at the Palais de l'Industrie, the steam jacket was not in operation. It will be of some interest, however, to refer to the test made in October of last year at the Brussels National Exhibition with an engine of the same design as the one now in our hands. The following are some of the best results.



## THE JAHLOBOCKOFF SYSTEM AT THE PARIS ELECTRICAL EXHIBITION.

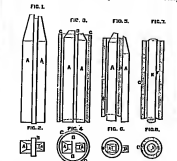
No. 1.

The memorable exhibition which contained the germ from which has sprung the whole of the industry of electric lighting, dates from the early part of the present century, but it commenced to bear fruit only a few years since. Up to 1870, indeed, the electric light was familiar only to a few ropemakers, and existed as a scientific wonder, never leaving the laboratory but for exhibition purposes, or in some rare cases where the rapid execution of public works rendered economy a very minor consideration, and where the regularity of the light was but of little importance. To-day the electric light of many systems burns in thousands of lamps. Whole districts of London, Paris, and New York are lighted by it, and hundreds of workshops employ it to the extent of gas. In many clubs, public offices, stores, and in some theatres, it supplies the sole means of illumination, and it may be readily seen to possess that before long it will be brought widely into use at the beginning of this surprising development sought neither to turn the subject to their profit nor seriously to combat it, began to realize that somewhat tardily that indifference and contempt are insufficient to arrest the marvellous progress. The press advocates it, the public approve it more and more, electric light companies continue to spring up and grow, and a new race of inventors appears to have been created. And the International Exhibition of Electricity, which was held at the Palais de l'Industrie, is the natural outcome of this astonishing movement, which promises under all its various phases to develop into the most important industrial revolution that the present century has witnessed. To no one person excepted, but among the crowd of scientific workers, it is certain that a first place must be accorded to Gramme, and to M. Jahlobockoff. All visitors to Paris during the International Exhibition of 1878, will remember that Gramme and Jahlobockoff made Paris brilliant, and the Jahlobockoff pavilion, insignificant as it would now appear, only three years later, continued by far the most striking exhibit in this department of industrial science.

For this reason we have commenced our series of articles on electric lighting at the present Exhibition with the Jahlobockoff system, although for another reason it deserves priority. Since the opening of the Exhibition a powerful association has combined under one management the patents of Jahlobockoff, Gramme, Janin, Westinghouse, and Royner. The magnitude of its resources and the position of its directors alike give it in all justice the place of honor. M. Paul Jahlobockoff was an engineer officer in the Russian army, and was captured in 1869 with some private investigations at the Ecole Galvanotechnique of St. Petersburg, and afterwards had under his charge the telegraph Company. Towards the close of 1876 he started from Russia to visit the Philadelphia Exhibition, but got no farther than Paris, where he entered the establishment of M. Breguet, and on March 23, 1879, he secured his first patent for the electric engine. A short time afterwards a Russian gentleman, M. Vyrnatsky, who had been introduced into him by M. B. Desayroux, the *Portier* introduced him to M. B. Desayroux, at the commencement of 1877 a group of capitalists combined in the form of a *Synicats*, for the investigation of electric lighting, with a capital of half a million francs. Afterwards this capital was transferred into the *Société Générale d'Electricité* (properly called *Société Générale d'Electricité*), and the latter was formed by the recently into the *Compagnie Générale d'Electricité* with a capital of 20,000,000 francs.

The electric engine was presented to the Academy of Sciences by the President of the Academy, in the name of M. Desayroux. On that occasion M. Dumas spoke as follows: "I have the honor to bring before the notice of the Academy the results of investigations by M. P. Jahlobockoff on an invention which has made a great step in the problem of electric lighting. The Academy has already shown the appreciation of all the mechanism usually employed in ordinary electric lamps. The new business is composed of two carbon rods fixed parallel to each other, a slight distance apart, and separated by an insulating material which is maintained at the same rate as the carbons themselves. As soon as the current commences in pos-

sition the voltaire arcs play at the free ends of the two carbons. The adjacent insulating material becomes incandescent and slowly increases to the double ring of carbon, which. Their invention in question appears to me at first for the production of the known processes regulating apparatus, and I think the advantages may be summed up as follows: The heat from the combustion of the carbons lost in the air with the regulating lamps is utilized in the Jahlobockoff candle for the combustion of the insulating material. The consumption of this latter can be varied indefinitely, since a vast number of earthy materials may be used. The most refractory substances valuable for the arrangement of M. Jahlobockoff. We have ground brick, &c. But the most simple, and the least costly, is a mixture of sand and glass. Such was the first official description of the Jahlobockoff candle. M. Dumas's communication also referred to the ease with which the system lent itself to the divisibility of the electric light. This was achieved. Since then it has been effected in a variety of ways. The form and modes of construction of the Jahlobockoff candle have been changed greatly since 1879. Several of the candles were exhibited at the Palais de l'Industrie, and will be found of interest at the present time, when the standard patterns differ considerably. The commencement M. Jahlobockoff employed machine with direct currents, not as in this case the positive carbon burns so rapidly as the negative, he was compelled to have the two of the same section of the arc, as will be seen in the annexed sketches. Figs. 1 and 2 show the two results separated with an insulating distance piece. Figs. 3 and 4 show them surrounded with a suitable paper envelope filled with powdered refractory



material. In Figs. 5, 6, B is a tube of porcelain containing the larger carbon, and against which the smaller one is placed. Figs. 7 and 8 show two cylindrical carbons, of which the larger, G, is hollow, and encloses the second, the latter being separated by a coating of refractory material. These various types have now only an historical interest, and they have long been replaced by forms with equal efficacy, caused under the influence of alternating electric currents.

The exhibit of the *Compagnie Générale d'Electricité* consists of three distinct sections, relating to the three systems which have recently been appropriated into one association. The section relative to electric lighting on the Jahlobockoff system, comprises two special groups, one in the nave, and the other in one of the large salons as the first floor of the Palais de l'Industrie. The former occupies an irregular area, and makes a pendant to the exhibit of M. Christie, beside the large central basin. It comprises a large number of types of candles and miscellaneous apparatus. There are also two steam engines associated with Gramme's and Westinghouse's, the first example of a large alternating current machine on the Jahlobockoff system. This second exhibit consists chiefly of various kinds of Jahlobockoff lamps.

A study of the apparatus collected in these two groups necessitates some explanation of a retrospective character, but as the exhibit is not published, they will be read now for the first time with considerable interest. We have already anticipated above some of the earlier type of candle, and we

may now proceed to refer to some subsequent models, many of which are represented by specimens in the exhibit of the *Compagnie Générale d'Electricité*.

We have seen how M. Jahlobockoff arranged his direct currents, which necessarily involved a constant flow of the positive carbon about twofold that of the negative carbon. This ratio is, however, far from being mathematically exact, and varies with the quality of the carbons employed. In practice it was found that these were not consumed in equal quantities during equal periods. On the other hand the carbons were not symmetrical, which led to a further cause of error; and finally, in proportion to the difference in sections the carbons burned unequally, which added a fresh element of irregularity in combustion. By the use of alternating currents, making alternately each point of the carbons a positive and a negative pole, the carbons were consumed in equal quantities in the same flame. At the same time M. Jahlobockoff abandoned the use of unequal carbons, and also abandoned the use of aggregated carbons by M. Carré. These large quantities of carbons have been manufactured in very small quantities, and were reduced in five years to one-tenth of their original cost. The *Société Générale d'Electricité* alone has consumed over 3,000,000 metres, or nearly 1000 miles of these carbons. The type adopted as a standard is 10 in. in diameter. Later on we shall consider in detail the manufacture of electrical carbons, which is now becoming a large industry. It may be mentioned here, in passing, that in France the carbons are now generally delivered in sticks 10 in. long, with very smooth surfaces of considerable length, and having a spongy like that of a similar and very rare manufactured absolutely true, and in all possible positions in cross section and diameter.

The early examples of the present form of Jahlobockoff candle (see Figs. 9 and 10) consisted then of two cylindrical carbons, 10 in. in diameter, from 4 in. to 6 in. long, and having the lower end connected in copper sheets as to secure a good contact in the

holder. These two sockets were connected with a composition of borax and silica of potash, and were surrounded at their upper side by a fillet of earthed of the same material. The carbons were placed at their upper ends, and between the two was worked in with a spatula, the insulating material in the form of a plug. The plug was placed by a figure of asbestos paper, connected the tips of the carbons, and allowed of an instantaneous lighting of the carbons, and the lower end of the carbons was about three-quarters of an inch, but the insulating material was deficient in homogeneity, which resulted in spitting and scattering around particles, which were entirely incompatible with successful lighting. The mixture of silica and silica of potash was then replaced by silica hollow of diameter slip of porcelain from Rivers, and then by pieces of black lead, fused in steel mould, and at the same time in the sketch, Fig. 10, so that they fully surrounded the carbons. It is in illustration of the shape of similar pieces used in France, this insulating type was called "columba." The new type is still known as the "columba," and the electric length of the carbons was increased to 12 in., which is the normal length at the present time. Later on we shall consider the "columba," a very simple and expedient process was substituted. It consisted in filling the knaps paste into a holder fixed at one end of the carbons, and the knaps is forced through it by means of a piston, and issues in the desired form. It is then placed between the carbons, and the end is then pushed into the required













the iron core varies inversely, the one increasing exactly in the same proportion as the other decreases, and vice versa, and all unproductive and irregular action is eliminated. With the aid of these lamps in one circuit, and deriving their current from a Schuckert machine, the staircase at the principal entrance of the Exhibition is illuminated, and another series of four Filzen lamps worked by a smaller Schuckert machine, illuminates the engine and generator forming the exhibit, to which we are referring. At present the 20 horse power nominal semi-portable engine of Moxes. Howey is driving these two machines, as well as the Gramme and Siemens machines for M. Javel's lights, but in a short time the same engine will be working the apparatus for an additional twenty Filzen lamps, as well as another installation of Joel candles.

## JAVEL.

The Joel system shown by the same exhibitor, may be called a modification of the Werdermann lamp, and in general mechanical disposition has the appearance of a Werdermann lamp turned upside down. It differs, however, in several essential particulars from that arrangement. In the first place the negative electrode of M. Javel's lamp is of bell-metal, while that of M. Werdermann consists of a plate or cake of carbon. The Joel lamp consists of a vertical pencil of carbon forming the positive electrode, the luminiferous in diameter, resting on a lower point upon the middle of a block of bell-metal which is connected with the negative terminal of the machine. There is also an exceedingly simple and ingenious automatic arrangement for releasing the clip by which the upper carbon pencil is held and dropping it up to the lower electrode directly its point is so far burnt away as to cause contact between the electrodes, and also for short-circuiting the lamp the moment the current is interrupted; there is also a simple arrangement by which the opening of the circuit of one lamp in a series short-circuits that particular lamp so that the others are not affected by its extinction during the process of putting in fresh carbon pencils. The Joel lamp is simple. One of the rooms on the upper gallery is illuminated by six of these lamps, which form part of a circuit of ten, the other four lights being at the driving station, the others employed being one of the new upright form of the Siemens direct-current machine.

## SIEMENS.

Moxes. Siemens contribute a magnificent display of electric lamps. At the principal entrance and below the gallery is a very handsome and richly ornamented chandelier, partly of steel-bronze and partly of nickel, carrying six arc lights deriving their currents from a Siemens alternating-current machine. These lamps are of the principle known as the Siemens differential lamp, which has already been described in these columns. There are several single lamps of this form which illuminate Moxes. Siemens' exhibits on the ground floor, and there are three others in one of the rooms leading out of the north gallery. Moxes. Siemens contribute also a number of their "pendulum" lamps, such as are used for the light in the City of London, and which are actuated by continuous currents requiring one machine for each lamp, while the differential lamps working with an alternating current can be maintained in series of six or eight in a single circuit, and with larger machines with still more lamps in circuit.

## JAVEL.

One of the most perfectly lighted rooms in the Exhibition, and which stands with Mr. Swan's exhibit the distinctive characteristic of great beauty of effect, is that which has been handed over to M. Javel, of Leiden. The lighting of this room is effected by two chandeliers—first which can be called—in general form consisting of an opaque cylindrical box open at the top and having four ornamental brass rods from the edge of a large circular disc, the underside of which is bent white. Within the cylinder is placed a Javel lamp, which is completely hidden by the disc. The light of the four rays emitted by the electric arc are received by a vertical reflector the edge of which forms part of the transverse rim of the cylinder or vase, and are by it projected vertically upwards on to the large circular screen, which thus becomes the only visible part of the apparatus. Nothing can possibly exceed the perfection of distribution or pleasantness of illumination which this

arrangement attains. The place is very brilliantly illuminated without any approach to a glare; what is perhaps still more remarkable is the fact that shadows of persons and objects of smaller size are completely eliminated, the distribution being so perfect and uniform and the area of illuminating surface so large that a passing object casts out but an insupportable quantity of light from the generally illuminated floor. M. Javel's lamp, although exceedingly simple in construction, is one of the best electric regulators in use, and its perfection at the Paris Exhibition excites the admiration of all who see it. There is one kept burning the greater part of the day in one of the Belgian pavilions in the main hall, and its light appears to be perfectly steady at all times, and the two lamps in the upper room, of which we have been speaking, appear on all occasions to be doing their work to perfection. The lamp itself could hardly be much simpler. The lower carbon holder is of iron and forms the core of a unguettable bell included in the circuit, and by which the length of the arc is regulated; and the corresponding movement of the upper carbon holder is controlled by a simple system of cords and pulleys, which is actuated by the movement of the lower carbon holder. There are, of course, various adjustments which we shall probably refer to when we illustrate the lamp, but the above will give an idea of the general principle on which this very beautiful regulator is constructed. M. Javel exhibits several specimens of his lamp of various sizes, and one of which is now in place, a lamp, the arc of which is surrounded by a fish-shaped framing carrying a number of circular lenses arranged in two circles one below the other, the whole being being rendered necessary by the axes of all the lenses converging to the centre of the arc. On a lower stage are fixed as many lamps as there are lenses, each lamp being mounted on a universal joint, so arranged that it can be turned in any direction, but is always in the line of its corresponding lens. By this very primitive and somewhat clumsy arrangement the light of a single arc can be divided into beams transmitted in various directions, or by a different adjustment of the mirrors the same rays can be concentrated in almost any required direction.

## GRAMME.

In a room on the same floor there is a very interesting collection of apparatus exhibited by M. Gramme, of Paris, five of whose lamps illuminate the room, being fed in a single circuit by a Siemens alternating current machine. The construction of this lamp is very simple, and judging from its performance at the Exhibition, appears to be a very efficient arrangement; we shall probably illustrate this lamp on a future occasion. M. Gramme exhibits also some details from the electric lamp of M. Bepiet's having a pair of carbons converging so as to form a V, at the apex of which the electric arc is maintained either against a fixed carbon, or against the apex of a second pair similarly disposed. What is, however, the principal point of interest about M. Gramme's exhibit is his very interesting alternating current machine, in which the magnets and field coils and the armature are fixed. In this machine a set of twelve electro-magnets, attached to a revolving disc, so that the axes are parallel to the axes of the shafts on which the disc rotates, is rotated between two sets of twelve bobbin arranged on the circular frame of the machine; the electro-magnets, which are of the ordinary form, are excited by the current from a small Gramme machine, but the induction holds of the two fixed armatures are of very curious construction, being filigree in general section, and composed of alternate layers of thin, soft iron, and coils of insulated wire. (In the top of the machine there is a table, to which is attached a set of forty-eight sliding screws, by which no less than twenty-four circuits can be derived, which can be either employed in so many distinct circuits, or be coupled up as desired. With the machine driven at a speed of 800 revolutions per minute, the current is very strong, something similar in construction to M. Javel's regulator can be maintained in action, or by coupling the circuits in pairs, the machine will feed twelve Jablochoff candles.

## MAXIM.

In another room on the same floor is the exhibit of the lights of the United States Electric Lighting Company of New York, which are in connection with

the machines on the ground floor, to which we have already referred in previous columns of this Exhibition. The Maxim display consists of 12 Filzen lamps distributed as follows: In the middle of the room is a chandelier containing forty-one lights, and around the room are twelve very fine glass globes, carrying six globes each, and on the table in the process of manufacturing the lamps may be seen in operation, are two carbons in support of six lamps each. The illumination of this room does not do justice to the Maxim system, for although there are 120 lamps in all, and in the small space, the illumination is a comparatively favorably with that of the other rooms in the Exhibition, and is very far inferior to both the Swan and the Edison exhibits; the way be that partly to the distribution of the lamps, but we think not so much to the sooty appearance of the glass globes, as it apparently seems to be an inseparable character of the Maxim lamps—consisting as they do of attenuated atmospheres of gas—while for a fine deposit of carbon to be formed on the interior surface of the glass globe.

## SWAN.

We have already noted the very beautiful and highly tasteful Swan exhibit, so we need not refer again to it here except to remark again the fact in this place that the lecture theatre is illuminated by 350 Swan lights, that is to say, 100 in the middle of the room supported on eight suspended chandeliers, and carrying twenty lamps, and around the walls there are sixteen levelled and lit with twenty globes. The adjoining buffet is illuminated by three very graceful chandeliers supporting some two hundred some Swan lights, in the corridor of the British Post Office there are forty eight, and in the offices of the British Commission there are twenty-one. In other parts of the Exhibition, as well as the telephone room, in which the operators' instructions are in action, and in some of the galleries in other parts of the building, there are more lights of this interesting system, and we believe that the arc in the Paris Exhibition no less than 1200 Swan lights in actual operation.

## EDISON.

Mr. Edison contributes a highly interesting collection of apparatus to almost every department of electrical science, which we will deal with in their respective places, but now we would refer only to his lights, which need to here with great beauty and steadiness. The form is almost identical with that of Mr. Swan's lamp, the only difference being that the carbon filament in Mr. Edison's lamp is a simple loop, while in Mr. Swan's lamp it is a complete turn. In the Edison galleries there are two glass chandeliers, each carrying sixty lights, and sixteen very elegant smaller lamps pendant, each supporting three globes. Around the walls there are seventy six brackets, each holding one lamp, and Mr. Edison exhibits twelve single-light table or reading lamps, making 228 in operation at the present time, but the larger chandeliers and engines which are daily expected to arrive from America will enable a much larger installation to be made.

There are throughout the Exhibition such a vast number of different lamps and systems that it would be impossible within the limits of a single article even to mention all the lamps which offer so interesting a field of comparison as those which nightly illuminate the Palais de l'Industrie; we must therefore defer to some other time the giving of the distribution of the lights of M. Jablochoff, Guldner, Gramme, Deleury, Wilson, Javel, Werdermann, and others, as well as two very interesting exhibits of the department of electric generators, namely, that of M. Clere, and an exceedingly interesting machine designed and contributed by Professor Jüngers, of Copenhagen.

## NOTES.

## THE ALBION TUNNEL.

The Albion Tunnel, which is nearly completed by the American Tunneling Co., is not expected to be finished till four years from now. Its length will be nearly seven miles, and the total cost will amount to nearly £1,000,000. The tunnel is now starting, or about 100 ft. per year. The St. Gotthard Tunnel is nine miles long, and cost £400,000 a year, the Mont Cenis Tunnel is eight miles long, and cost £250,000 per year. The Eyrol entrance to











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by the rays of a thousand electric lights. And it is a remarkable and interesting fact, and one very characteristic of the fiery color of combustion gatherings in France, that there was not a single report made to the police of any sort of theft, or of any injury done to anything in the Exhibition, at a little before eleven, when the cry of "dis- fire" announced that the great Electrical Exhibition would soon be closed for the last time. By a preconcerted signal, the steam whistle of every boiler in the place was turned on, all the fire alarms and electric bells were set going, and to the accompaniment of the deafening din, which lasted till the place was cleared and the lamps extinguished, the great building was closed. No one who was present will ever cease to remember the effect of all the boilers of that great installation blowing off their steam through their whistles together under the central roof. From a distance into a lantern's ear in any part of the building was absolutely inaudible, for the whole air appeared to be vibrating in every direction, and the effect on the ears failed more or less for some hours after leaving the building. It was an amazing and not altogether inappropriate finish to an undertaking the success of which has made itself known in every quarter of the civilized globe, and whose close will ring in the ears of those who say it for many years to come.

Before closing this article let us throw a brief glance backward over the past ten years, and mark a few of the most striking inventions and discoveries that have most largely contributed to the present development of electrical industry. We see first the Gramme machine, from which date the utilization of electric generators, in practical form initiated, but never put to rest. Then the Edison incandescent lamps gave the first impulse to the electric lighting of to-day, now so rich in many processes, due to the labors of numerous others, of Siemens, Brush, Edison, and Swan. Then the telephons of Graham Bell, multiplying distances more effectively within limits, than the telegraph. Finally, the transmission of power by electricity, to which attention is now being especially turned, which promises well for the future, and which was largely illustrated at the Exhibition by the exhibits of Oulton, Siemens, Gramme, and on an enormous scale met with largely divided currents, by M. Marcel Deprez.

These are the most important of the beginnings which led the foundation of the Exhibition of the Palais de l'Industrie, and secured for it so triumphant a success, which will bear fruit in the immediate future, and be followed by others probably of greater magnitude and of equal interest. Indeed scarcely are the doors of the Palais de l'Industrie closed when the project for a similar exhibition has been formed—and the Crystal Palace venture, of which we have already expressed our opinion, but as official exhibition, under official sanction, requested by the leading men of science, and completed, as has been the case last past, by an International Congress of Electricians. We trust that the Exhibition may be held in London in 1883, and we are certain that it will continue working till work commenced in France, and be rich in the new inventions and discoveries that the next ten years will witness and the world will have developed.

Menlo Park Scrapbook, Cat. 1085

This scrapbook covers the period 1880-1889 and contains clippings relating to patents, patent laws, and patent litigation. Most of the clippings in the first part of the book are from 1880-1881 and concern patent laws in the United States and Great Britain. There are also miscellaneous clippings from 1881-1887 pertaining to electric lighting, particularly litigation in the United States and controversies between the Edison and Maxim Interests in France. The second part of the book contains clippings from 1888-1889 regarding patent litigation. Among the cases cited are Edison v. United States Electric Lighting Company, Edison v. Gramme Electric Company, and Edison v. Westinghouse. There is also material relating to the Bates Refrigerator case, in which the U.S. Supreme Court ruled that the expiration of a foreign patent had no effect on the validity of a U.S. patent. This case served as an important precedent for establishing the validity of Edison's electric light patents. The spine is labeled "T. A. Edison. No. 67." The book contains 144 numbered pages.

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DECEMBER 10, 1880

## THE MANAGEMENT OF RIVERS

In the Parliamentary session of 1877 the House of Lords appointed a Select Committee to inquire into the operation of existing statutes in respect to the formation and proceedings of Commissioners of Sewers, and Conservancy, Drainage, and Navigation Boards. The Committee might be supposed to consider by what means such bodies might be made more efficient and inexpensively constituted, their proceedings improved, and their powers enlarged so as to provide more efficiently for the water, the prevention of floods, and the discharge of other functions appertaining to such Boards. The scope of the inquiry was wide, and at the same time well adapted to bring to light the defects in the main question. The Committee completed their

But this is no mere local story. Just past the Plough Bridge the Quaggy runs into the Havonbroun, and the limited streams speedily come to a spot known as the "Bottle Neck," where the waters meet with a check through the action of a dam. The proprietor is willing to do anything in his power to let the waters run off safely, but if he dares to enlarge the outlet, he is liable to a fine of £1000, and there may occasion by creating floods further down. There are two mills below him, and if he lets the water run with greater freedom than of yore, the floods which pass away from the mill race will sweep down the river, and the Board of Works have done a little to save Lewisham, by opening up an additional channel at the Silk Mills, the result being that the Board shall bear all the responsibility. If the Board were to take on a scarcely a hundred yards below the new channel, and when the water has shot along the new path come to a sudden stop, the flood would be forced back on the bridge to check its career. The flood would be adjacent land. When the flood goes away from this point, then there are the mills below. One of these mills is the property of the Board, and the other is not both of them; hence it may happen that if the Lewisham Board buy up the water rights at the Silk Mills, there will still be a block in the Greenwich district.

The value of water rights connected with a mill is of course considerable. Although steam is now available, water power is cheaper than steam. Hence, to buy up the water rights of the Lewisham Silk Mills would be a profitable speculation. It is true that the water rights of all this would only lead to a flood lower down, unless the course were made clear to Deptford Creek, and so into the Thames. The Metropolitan Board have been appealed to by the owners of the mills, but they have refused to show the value of an artificial outlet. The Quags and the Ravenbourne are in the jurisdiction of three different district boards—Thameshead, Lewisham, and Deptford. The district boards have power to purchase water rights and mill channels, but they have not done so in some common action, it would be of little use for one to take any steps in the matter. The Metropolitan Board have functions similar to those of the district boards, but they have no power to purchase water rights, which the district boards do not possess. Hence the Metropolitan Board could carry out a comprehensive scheme within the limits of the metropolitan area, but not farther. What a pity that the Metropolitan Board has on a broader scale in many parts of England. There is a tangle of public authorities and private rights, and the rivers having no proper masters have become masters themselves. The Metropolitan Board have no power to do what is to be intolerable. The evil is a growing one, as shown by the report of the Lords' Committee, and by the state of the Thames. A great deputa- tion which visited on Mr. Duxden few days ago.

Question was set forth in the report of the Committee of 1877, and formed the groundwork of the Government Bill, and the Government have now a statement recently made by General Burdett at a public meeting, the President of the Local Government Board is now determining whether a similar measure is necessary.

In the next session of Parliament, Mr. Moqueux has also each waterways, with subsidiary proposals one Authority for the whole of the country.

It can be readily believed the assertion that if something like this were done, the Thames, and other rivers, millions of pounds would have been saved in the year.

## CIRAP PATENT

On Monday night a paper was read before the Society of Engineers, by the name of W. Garrison, "On the National Value of Chimp Potatoes." An abstract might be found in another page. The paper as a whole deserves to be placed among the curiosities of literature. We must confess what we are about to say by stating that we use language used by the author, and in the order desired. His style is bold and agreeable; his matter admirably put together. The paper was neither too long nor too short, and it was most ingeniously and effectively illustrated by diagrams or black plans, supplying the deficiencies of the text. The paper was, in fact, very convenient, and we are glad to have it, which

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be noticeable.

At present Great Britain is, beyond question, the greatest manufacturing country of the world, which fully accounts for the number of patents taken out here by foreigners; also in, however, the United States are not far behind, and the latter country has been manufacturing since that her rapidly rising to a first place as a manufacturing nation that her competitors with the mother country is being more and more conspicuous. The Americans attribute their rapid success to their efficient patent system—ride their numerous trade journals, and even the official reports of their Patent Commissioner, and they will be readily admitted by all that the country which has the most patents will be the most powerful in wealth, and that the invention for advancement of the country is the most important. The reduction of our exceptionally high patent stamp duties would greatly stimulate invention, and is therefore to be sincerely desired.

In conclusion permit me to state that my only desire is seriously to draw as much attention as possible to what I fully believe to be the very hurtful action of our exportation policies and duties upon the prosperity of the country, and therefore I do not think it worth while to bring in irrelevant matters, such as "Seneca," or "Restless, wretched men who go to America for change," or "the persuasive eloquence of the Mormons."

FRANK W. JOHNSON.

January 1st.

January 1st. FRANK W. GILKISON.

**THE ATLANTA.**

THE ATLANTA.  
 Sir,—It is only in a scientific paper that a point of much public interest in the report of the Atlanta Committee can be brought out clearly.

The Committee reports—p. 8, par. 34—"What we are required to say is, whether the *Atlanta*, when she left England in November, 1879, was a *slave ship*; and the conclusion to which we have arrived, after a consideration of all the facts of the case, is that

come, after a full consideration of all the facts of the case.



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Should he be unable to make a substantial concession to those from whom he differs, the result, so far as one can at present foresee, will be a "dead lock."

If you think well of this proposal, and if it meets with approval at the hands of your readers, I should be willing, with your permission, to submit for your and their consideration, draft petitions, embodying the suggestions appearing in letters you have from time to time inserted, and I would

Figure 1. Schematic representation of the experimental design. The subjects were divided into two groups: the control group and the experimental group. The control group was divided into two subgroups: the control group and the experimental group. The experimental group was divided into two subgroups: the control group and the experimental group.

1. *Journal of the American Medical Association*, 1997; 277: 1033-1037.

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pro, assuming that my proposals have your approval and support, and if Mr. Arthur Paget will consent to allow his contribution to be devoted towards the expense of carrying out my suggestions, then I shall be happy also to contribute my pounds, in the hope that some practical good may result.

I am, Sir, your most obedient servant,  
A CONSTANT READER.  
London, S.W., December 29, 1880.

TO THE EDITOR OF ENGINEERING.  
SIR,—The principal objections to the present patent law

1. The inadequate duration of the patent right.
2. The excessive cost of the protection afforded—such as it is.

4. The expensive nature of patent litigation, and the means thereby afforded wealthy and unscrupulous persons of monopolizing the market and hindering the progress of the arts and sciences.

It is so doubtful as to be impossible to devise a law that will satisfy all parties, but the following suggestions meet, I believe, most of the hardships of the existing law:

2. The fees or dues to be, on grant of letters patent, 5*l.* ; at the end of the third year, 10*l.* ; at the end of the seventh

year, 20l. ; at the end of the fourteenth year, 40l. ; in all 75l. All dues to be payable at the Patent Office by post or otherwise any time within six months of due date, subject to a fine of half a crown in the pound per month, or part of a month overdue.

3. The documents to be a simple application for letters patent accompanied by a completely descriptive "specification." No specification to be published or open to public inspection for six months. Nominal patent right to be granted as matter of course, notwithstanding any apparent want of novelty or want of utility.

4. Patents to be allowed to amend their claims at any time, either by disclaiming any part found to be old or useless, or by adding claims for further improvements on paying \$1. for each "amendment," either by disclaimer or by addition.

except of the request of some person, not necessarily the patentee, sufficiently interested in the patent to pay \$1. or 2%, according as to whether the inquiry is into the novelty of the entire claim or the amendment or additional claims only. The result in any case to be first communicated to the patentee with right of reply on his part, and the final opinion of the examiners to be appended to the patent.

6. No action shall be sustainable for infringement of a patent until such patent has been examined as above. Alleged infringements to be inquired into in the first instance by the Board of Examiners, who shall determine whether or not the patent has been infringed; and if so, in what manner. In the event of both parties accepting this decision, the damages or other settlements to be, if necessary, referred to an umpire appointed by the litigants themselves, if they can agree on one, or by the Board, if necessary. Either party to be at liberty to appeal to a court of justice on undertaking to pay his own costs in either suit, and giving security for his opponent's, in case the Board's finding is confirmed. The applicant will oblige the

cases. The inventor of the screw of frise, however, will probably be considered still too high by those who migrate the United States alone. It must be borne in mind, however, that the proposed allowance of additional claims enables an invention to be covered by one patent, instead of by several, as at present necessary. Many papers, against the granting of the right of priority to a provisional protection. But the protection is known to be definite. And even the full term of six months is in most cases too short to allow the predictability and utility of an invention to be tested. Certainly too short to allow the invention to be perfected. Generally also too short to enable a poor inventor to give the aid of a professional writer to his invention. It is quite impossible for an inventor to make sure—how careful his search—that his claims are all absolutely correct.

In regard to the much discussed question of examination, it appears to me that it would tend to increase expense to examine old patents applied for. There are now, undoubtedly, a large number of patents which are of no value, but there is no reason why there should not be, a number of patents of very appreciable commercial value to their owners, and which injure nobody, but whose validity would not bear searching investigation. If nobody is interested in upsetting them, to the extent of a five pound note, why need they be meddled with?

I am, Sir, your obedient servant,  
W. H. NORTHCOTT.  
Hatcham Iron Works, London, Dec. 29, 1880.

TO THE EDITOR OF ENGINEERING.  
SIR,—Mr. J. Angelo Fahie finding I am "one too many"

for him nor antithetical plausible excuses in lieu of preventing (which I well know he could not) that "D. H." and I were in the wrong. Mr. Fabrice speaks of "D. H." as "my friend" and "my ally" with the same recklessness that characterizes most of his remarks to me. As far as I know I never set eyes on "D. H." and as I am quite certain that I never did, he has no claim of the courtesy of an "H. H. H." Moreover, I am aware of the knowledge of ever having had the goodness of seeing Mr. Fabrice, and to extend of whose business, I may add, is a matter of my utmost indifference to me. I simply took on the matter entrusted to the broad scientist that only one producing on a public scale

clusion and advertising himself as an authority of being  
ing, should be prepared to prove the accuracy of his  
ertions. Those who are well up in patent matters are  
are that on paying the official fee any one can see at the  
ent Office the original documents relating to a patent,  
very interesting it is in some cases to notice the style  
work the documents exhibit down even to the quality of  
ling itself. Usually the agent's name appears on the  
uments; and people who are energetic can usually get  
other a surprising amount of information. Right through of transmits

A person comes forward with a license to "steal" an authority on patent matters, it seems to me any one who likes is quite justified in making such investigations as may think proper, that he may judge of the weight to be attached to the opinions expressed by such an "authority." I refer to myself the right of adopting this course whenever occasion may arise, especially as I held the opinion that advertisements ought to be paid for and put in a responsible part of the paper.

The suggestion involved in the letters of Mr. Fahie and A. Valenteo<sup>1</sup> that I should condescend to enter into private correspondence with them, because they are unable to cope with me in your columns, is simply preposterous. But in your columns I am ready to fully establish (when called on) the accuracy of such statements as I have made.

ANTI-Ifumpu.

London, December 20, 1880.

TO THE VOICE OF ENGINEERING.

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Loughborough, December 28, 1890.

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At the December 24th meeting of the Society of Engineers, London, Mr. Joseph Bown, President, in his chair, a paper was read by Mr. Frank W. Gilson on "The National Value of Cheap Patents." The author pointed out that in England, the inventor, did no work for the mere sake of making a patent, but he made it for the purpose of having an advantage for himself or his company, by conferring upon him what might be a much greater advantage. The advantage an inventor might be secured to enjoy in a patent; patents were, therefore, regarded as an evil cost as possible. A patent was not a reward for the inventor, but a means of making a thing which had been an approved process and method of doing it, a quicker and more economical manner than before, before being possible. Inventions were very seldom "happy thoughts"; they were usually the result of long and arduous consideration and many experiments, which were not made until the inventor was sure of the value of the work which was undertaken in the hope of reward in the form of a successful patent. The patentee was not an inventor for getting his invention known and adopted; it was not an invention it would be certainly a discovery, but it would be adopted only in consequence of the persistent search and by its adoption in the past in advance had been made.

[illegible][illegible]

Mr. Grelson went on to observe that this table showed that in the United States three patents were granted for one there, after allowing for the difference in population, and that the stamp duties on one patent there would pay those on twenty-five patents in the United States. We might, therefore, fairly say that the British inventor was handicapped 25 to 1 in favor of the American inventor. It was to be carefully

remembered that in housekeeping the lawyer they had employed asked the duties. The author drew attention to Mr. John Stundfield's proposal for reduced stamp duties, which was as follows: On application (to cover the provisional protection), 2s.; on filing complete specification (to cover the provisional protection), 2s.; total, 4s.; there should also be a second year of it. Provisional protection to be granted for one year, and the duration of patents to be twenty-one years. After remarking on the advantage of official technical examination of applications, the author pointed out that it was impossible to exclude the enormous indirect loss the nation suffered from the exorbitant issue of stamp duties, which drove abroad and stifled a large proportion of that inventive faculty upon which alone they were dependent for holding their place among the nations, and which might, if not so impoverished, save a considerable number of those now annually lost to preventable accidents, and might give employment to many who are now unable to obtain work, and who in consequence have to be supported in idleness.

## PATENTS

TO THE EDITOR OF THE ENGINEERING.

SIR,—I am very glad to see that the suggestion of Mr. Tweddell to form a committee to petition Parliament for improvements in the Patent Communication Journal has elicited approval from so many various sources. I feel sure that those who have discussed the matter, both in your columns and elsewhere, will feel the small comparative importance of their four various shades of difference of opinion, on what may be called "side issues," and all will agree to act in strong and hearty support of the committee when formed.

I hope the time has now arrived when Mr. Tweedell will see that the discussion is followed by prompt and energetic action, and all seem fully agreed that no better man can be asked to take the initiative in forming a committee.

I feel that the fact of my being so far away from London, the natural centre of national action, renders me unable to give as much assistance as I should like to give, to those who work, and it was this feeling which made me at first offer the only substitute I could, in accordance with that offer I now enclose \$5, as a contribution towards the necessary expenses of the action which I feel sure will now be taken, and I know that many others who cannot give the necessary time, thought, and work, will be glad to send you subscriptions to the fund to help to make the petition one properly worthy of the importance of the subject, and if it should eventually appear that more money is

Engineering Dec 17<sup>th</sup> 1880

N. mld. Aug. 3, 1881.

## As Is the Invasion of the Telephone

[illegible]

Tribune. Aug 3rd 1988

**THE PLATINUM LAMP**

PATENT OFFICE DECISION IN FAVOR OF MAXIM AFFIRMED ON APPEAL.

WASHINGTON, Aug. 2.—The Commissioner of Patents, to whom Mr. Edison appealed, has finally turned the decision given by the Examiner of Interferences and Examiners-in-Chief in favor of Mr. Moxim, one of the electricians of the United States Lighting Company, in the case against Mr. Edison involving the Platinum Lamp.

S. D. Eaton, vice-president of the Edison Electric Light company, gives the following explanation of the case:

[illegible][illegible]

This decision of the Commissioner of Patents ends the appeal in the Patent Office, and the practical result is that a patent will issue to Mr. Marzio for the same invention for which a patent has already been issued to Mr. Edison. Thus both inventors will hold a patent for the same thing. A United States Court can be invoked to cancel the Edison patent."

Sun. Aug. 3. 1941

**NOT IMPORTANT TO EDISON**

### An Account of the Murders in the Patent Office

WASHINGTON, Aug. 2.—The Commissioner of Patents, to whom Mr. Edison appealed, has finally affirmed the decision given by the Examiner of Interference and Examiners in Chief, in favor of Mr. Marx, one of the inventors of the United States Lighting Company, in the case against Mr. Edison, involving the

celebrated platinum imp. which created a boom in the stocks, and caused such a boom to the Edison Company's stocks.

[illegible]

the position for a suit for the same—discovery of the suit by the Post Office. The first trial was held in the Federal court at New York, and was widely reported in the press. The jury returned a verdict in favor of the defendant, and the Supreme court of Feb. 6, 1887, affirmed the verdict. The case was then taken to the Federal court at New York, and was heard by the Federal court. The jury returned a verdict in favor of the defendant, and the Supreme court of Feb. 6, 1887, affirmed the verdict. The case was then taken to the Federal court at New York, and was heard by the Federal court. The jury returned a verdict in favor of the defendant, and the Supreme court of Feb. 6, 1887, affirmed the verdict.

"This decision of the Commissioner of Patents, made today, ends the final appeal in the Edison case, and the practical result will be that the Edison patent will be maintained in the patent office, for which a point has already been made by Mr. Edison. Thus both inventors will hold a patent for the same thing, a United States Edison patent, and a United States Edison patent, and when a decree cancelling it is made, I suppose there will be still another suit to say, a fourth instance published in the patent office, because of the decision of the Edison company."

Mr. Edison said it was the policy of the company to fight all battles to the end, so much so that they did not intend to stop until they were wholly worn down ready to protest themselves to their full rights.

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[illegible]

precisely, in which it was not forth that by this invention the substitution of the electric current for the mechanical force of the engine, and the light made practicable for general domestic and commercial use.

"It was this invention," said Mr. Pilsbry, "that caused the memorable panic in the stock market of 1879, and which was not averted until it was disproved by some of the officers of the Edison company that 'then, as now, neither the decision of the courts nor the testimony of the witnesses had any interest in the company'."

The testimony of Pilsbry, who claims, will correct the errors of the mode of procedure taken by the United States Company in this business, and after the case is decided on an individual account, the United States Company was reorganized in June, 1880, and has since quietly, making extensive experiments, added

Mr. J. M. Eaton, Vice-President of the  
American Light Company, said yes  
in response to the statement made by  
the President of the United States  
Company, regarding the recent  
loss of the Office in the contest over the  
patent.

It is definitely true that the glory as well as the profit of ownership by the company of what Mr. Maxim invented and the company purchased. And that remains true. Major (sic) is, in an interview with the reporter, that the information regarding was given to him, about him, I have just this to say, Maxim told me he never made any such offer. He did not know of such offer being made by any one else, and I therefore, (in answer to the Major's question) have been instructed, in this connection, to say, such offer

on Edison's *Imagin.*  
Edison, Nov 26. 1891.  
See *Edison*, No. 50.

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**Figure 1.**

Colchester, July 16/87.

INVENTORSHIP OF THE BELL PATENT.—Injunction had been given at Boston in the United States Circuit Court in the case of "American Bell Telephone Company and others, v. Albert Spencer and others." This was a case of alleged infringement of two patents granted to Alexander Graham Bell. The defendants admitted that they had infringed some valid claims of the second patent, but the plaintiff had given them no evidence of such infringement. They relied entirely upon the fourth claim of the first patent, which in such case condescends in its scope. This claim was that the defendants were using a method and apparatus for transmitting vocal sounds which resembled those of the plaintiff in producing electrical undulations, except from the vibrations of a diaphragm, and sending them along a wire to a similar receiver at the other end. The Court decided that the specific method of producing the electrical undulations was different. It was made on the principle of the aërophone, which had been twice improved since the date of the first Bell patent. The judge said:—"If the Bell patents were for a mere arrangement or combination of old devices to produce a somewhat better result in a known art, they are invalid, a person who substituted one element unknown at the date of the patent might charge the charge of infringement." But Bell discovered a new art, that of transmitting words by electricity, and has a right to hold the broadest claim for it which can be permitted in any case. It is not the slightest right of sending sounds by telegraph without any regard to success but to all means and processes which he has both invented and claimed."

Windsor, Oct. 6/87.

The Work of the Patent Office.  
The Commissioner of Patents has forwarded to the Secretary of the Interior last report of the operations of the Patent Office for the past fiscal year, and the estimate of the annual necessary during the next fiscal year. The number of original patents issued during the first nine months of the present year was 12,043, an increase of 1,220 over last year. The number of the office for the same period were \$50,741, more than of years for the corresponding nine months of 1886. The report transmits a considerable increase in the examining fee and the clerical fees of the office, and the following appropriations: \$100,000 to carry out the work of the Patent Office and the publication of 10,000 volumes of claims, \$15,000 for reproducing hand and examined drawings, \$10,000 for photographic drawings, and \$20,000 to complete the Official Gazette for the present year.

N.Y. Daily Tribune, Monday Aug. 8/87.

# MAJOR EDWIN HARRINGTON'S

THE INVENTION OF THE

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lamps at a distance of more than 2,000 or 2,002 feet from the central station. The

the turning of the crank moves and spring bar  
an insulated position, thereby breaking the short  
in.

Under the old system it was a matter of impossibility to operate the incandescent lamps at a distance of more than 2,000 or 2,500 feet from the central station. The

The Engineer - Sept. 26/80

### THE DEFEAT OF THE BRUSH PATENTS.

[illegible]

"As we have recently remarked in relation to this case, a fundamental principle of importance is involved in the decision. The clamp mechanism of Brush, although perhaps the cheapest and most convenient, is only one method among many of effecting the desired result of controlling the movement of the carlens, and that the competitors of the Brush Company, in case the patent has been sustained, would probably have done nothing more than alter their mechanism at a comparatively small expense and go on with their business.

[illegible]

"The claims of the Brush patents on electric light apparatus are many of them of such a broad and sweeping character, that it is sustained they would have gone far to amount to the Brush Electric Company a virtual monopoly of our lighting, but the unexpected strength of the defence, and the able and vigorous manner in which it has been developed, has now practically destroyed two of the patents, and thus materially weakened the position of that company.

"It now seems probable that the comparative future progress of the principal two lighting companies will depend much more on the actual merits of the apparatus presented to the public than upon the results of litigation which may hereafter take place between them, a result at which the public at least can have but little occasion to complain."

**WON'T CONSOLIDATE**  
**THE WESTINGHOUSE-EDISON**  
Pronounced a Canard by a High Official  
of the Former Concern--The  
Edison Patents

The Westinghouse Electric Company will not consolidate with its rival, the Edison.

"All stories of the merging of the interests of the Westinghouse and Edison Electric Light Companies, according to a high official of the former incorporation, are totally without foundation. "That story," said Assistant General Manager J. B. Humbird, originated in New York and—"

"Yes," interposed an employee of the company who was present, "I was with Mr. George Westinghouse in New York when he was interviewed and Paul Harvey said nothing that could be construed to mean consolidation."

"I don't know, of course, what Mr. Westinghouse intends to do," continued Mr. Humbira. "I have no doubt that the rival concern feels the impetus we are making in their business, and that they desire some such arrangement. They pretend not to know, but in Europe electricians will not enter into the three-wire system, but it is not." Furthermore, the Edison people

"I've been in position to take business out of the hands of the people and give it to their auxiliary corporations, and thus they cannot do, at least for some time to come. There is still a further barrier between them and the people, and I have certain value on my holdings so they think, until we recognize the value of their holdings at nearly their own cost, that they will sell them. But, at our patients at our estimate, we could possibly come together. No, sir, I do not think there is the slightest foundation for the charges made by the *Journal* of the Editor of the papers in that they are unqualified. We do not need them now. We are doing all the business we can do. Our examinations have nothing to say."

"No! I wish to infer that there may be a possibility of a sale, and not a consolidation," asked the reporter.

"No! No! Nothing of the kind. I mean that I know nothing of any deal or of any kind of sale, and I repeat that I don't think there is any deal or of any kind of sale. I have nothing to say."

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THE AMENDMENT OF THE ELECTRIC LIGHTING  
ACT.

## INTERVIEW WITH LOU THURMOND

The committee presided over by Lord Thurlow having sent in its proposed amendments of the Electric Lighting Act and made a general report, our representative called on Lord Thurlow a few days since to know how matters stood.

"Yes," said Lord Thurlow, as he turned over a bundle of papers, "we have published our report and sent it in to Mr. Chamberlain, with the amendments which we think necessary to make the Electric Lighting Act a workable measure, but it has been very little noticed by the press."

"You entirely repeat the 27th or 28th option to purchase clause, do you not?"

"Yes. We have done this because we believe that no modified purchase option clause meets the requirements of the case. We have found it impossible to hit upon what we think would be a workable and acceptable compulsory purchase clause. I quite admit that as the electric light industry grows, and its risks are more fully understood, capital may be obtainable notwithstanding that the community may have compulsory powers to buy the plant after the lapse of a reasonable period; but it is right that the pioneers should be encouraged and favored, and I think it is only fair that the electric companies should be given initiative in this work should be placed on a footing of equality with their powerful competitors the gas companies."

And that would you propose as a reasonable period after the success of business from lighting has been proved? "Fifty years." That would give the business time to get established, and to make inevitable risk during the experimental period. But I think that the price of electricity would be a very low price for electricity. It would also afford a fair encouragement to capitalists to embark in the enterprise. They could look forward to holding their property for some years after they had made it dividend-paying. The gas companies were not so dejected as they liked, whereas we are treated at the very outset as if we were. I think that the price of electricity would be introduced, but it would be particularly noted that we do not ask to be treated as if we were. We do not even ask for a monopoly. There can be no monopoly in electric lighting, for there are so many different systems to compete for the

"But surely if you get your powers under the Act of Parliament in the nature of provisional orders, you get sole control of your particular district. What is that but a monopoly?" "Well, even that need not be a monopoly. We have not yet gone into the proposed revision of the terms upon which provisional orders are to be granted under the amended Act, but it is presumed that those orders will compel the supply of electricity under conditions that will entail the forfeiture of our rights if not carried out satisfactorily to the public. In that event there can be no monopoly."

"There is one thing I should like to mention," continued his lordship, "and that is as to the opinion which I find prevailing to a large extent among electric light companies as to Mr. Chamberlain's views. It is strongly believed that he is prejudiced against the electricity industry. Now, I believe that to be perfectly unfounded. I have never met an electric light company of telling electricians that they are doing anything wrong or asking them to do anything. I have only seen slips that he has no prejudice against the electric light industry. On the contrary, he is undoubtedly swayed by fears of injuring the existing gas monopolies. Of course, it is his duty to protect their interests to a certain extent, and he is, no doubt, timorous and fearful of setting up another monopoly. And we have explained to him that we do not want a monopoly. All that we want is to be put on an equal footing with gas, so as to be able to compete with an existing monopoly. That is a very different thing from setting up another monopoly."

2. And do you think the Act when amended will lend to the Introduction of house-to-house domestic electric lighting?" "I don't think there can be any doubt that it will. The fact that the wires were removed, even to a less extent than has been indicated, electric lighting would at once make prodigious progress. There is one very difficult point in house-to-house lighting, and that is the matter of getting to this time of a good meter. But this is, after all, only a matter of time, and until, therefore, science discovers a perfect meter we must be allowed to control the use to which the electricity supplied by the undertakers is put by the consumer. Another point over which we had a great deal of discussion was the question of giving a constant supply. Electric lights are naturally against that condition, and the fact of their being of running in station during a portion of the day when few lights only are required. But we have conceded that point, and consider the difficulty as not a real one."

"When do you say your report formally before Mr. Chamberlain?"  
 "Well, we sent him the report and proposed amendments as soon as they were ready, and he has acknowledged their receipt and promised that they shall have his serious consideration, and that he would let us know when he would be in a position to see us. I think it is very likely that he may not do anything this session. It is a moribund Parliament, and a great question like this may very well be left to the new Parliament."

Character of article: *Teoneres*  
 From the: *Mail Ed.*  
 Published at: *24.*  
 Date: *5/25/85*

THE Edison Electric Light Company, of this city, to-day issued the following circular in regard to their legal claims to certain patents:

First.—That the patents of Mr. Thomas A. Edison, now the property of this company, fully cover the incandescent manufacture, sale and use of any and all practical incandescent electric lamps.

Second.—That the Edison Company, having begun suit at law for the enforcement of its rights under these patents, will not relax in their vigorous prosecution.

Third.—That the Edison Company is prepared to fully guarantee and protect all its customers, and to prosecute to the full extent of the law, all makers, sellers or users of incandescent lamps not duly authorized by it.

[illegible]

New York, May 23, 1865.



Character of article Report  
 From the Advertiser  
 Published at NY  
 Date 5/26/85

THE FIELD PATENT.

Important Decision by the

[illegible]

The application of which this forms one of the exhibits, was filed by Mr. Field in the Patent Office more than five years ago. About seven times Thomas A. Edison, of Menlo Park, and Ernest W. Siemens, of Berlin, filed similar applications, and during the whole time since then litigation has been going on in the Patent Office for the purpose of determining which of the three is the prior inventor. A large amount of testimony has been taken in Berlin, Paris, New York and San Francisco.

and shows a curious likeness of the almost contemporaneous invention of the same type by these able and distinguished men, each ignorant of what the other was about. The sheets are widely separated at Berlin, New York and San Francisco.

The Patent Office has now finally decided that Mr. Field is the prior inventor of the various things described and claimed in his application.

[illegible]

affirmed the Examiner's decision, November 8, 1884. Thereupon Siemens moved for a rehearing, which motion was denied by the Board before it was referred to the Commissioner for his opinion. His motion was denied, and he appealed to the Commissioner from the Board's decision. The Commissioner, after seven reasons, nisi the Commissioner would reverse the opinion and decision of the Board. He stated that hearing is required by the Commissioner, and that motion was denied. Finally, and with lively interest, Siemens moved for a rehearing. He made the seventh hearing. It was decided against him, and he said that he would appeal to the court, and he said that he would know that the seventh hearing rate since is apparently enough, and that severity times seven does not hold good.

Character of article *Sci*  
From the *American Geologist*  
Published at, *N.Y.C.*  
Date *June 29*

## The Electric Light.

[illegible]

Chicago Herald  
July 26<sup>th</sup> 1881

**Contesting Edison's Patents in Canada.**  
TORONTO, July 25.—The Westinghouse Electric Light Company, of Pittsburgh, the United States Electric Light Company, of New York, and the Consolidated Electric Light Company, are contesting Edison's electric light patents in Canada, and are supporting applications to the Canadian government to annul the patents for incandescent lamps and for the use of the same. The application to annul the patents will be heard in September. A. A. L. of this city, has been retained for the purpose.

N. Y. Times  
April 4, 1887.

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The consolidation of the Wrightington and Thomson-Houston Electric Light Companies' franchises, however, is not a consolidation of several companies of the kind against Mr. Emerson, who has recently been granted a patent for the multiple arc system of distribution. This patent, if assumed by the courts, will, it is said, give Emerson absolute control of incandescent lighting in this country, and thus the electric light business, because it is the electric light business, will be placed in the hands of one man from a common estate. The several companies will be exposed to prosecution for infringement, and it is not probable that they intend to settle for common defense. A discussion of this matter discloses the fact that all the electric light companies doing business in Philadelphia, and, as examples, are controlled by a Trust.

Pittsburg Press Dec.

**ELECTRIC SPARKS**  
THE PECULIARITY OF THE WARM  
INCANDESCENT LIGHTING  
Who Invented the Incandescent Lamp  
Honor Claimed in England and  
America—The Big Law Suit.

to talk today with a leading electrical contractor of this city some interesting things were learned by a representative of the Electric Light Association as follows:

"The present lighting business has many other topics.

"Fittingly the electric lamp industry may be said to be solely the work of the Westinghouse company, which is the largest concern in the world. In other parts of the country it is not the case; the Westinghouse people do not much mind any other kind of reason why it dominates here, owing to a great deal of advertising money it has in this neighborhood. The firm is big and powerful but it is also popular in offering lamps choose those people in demand. The method of treating them is what makes the difference. Thriving here is also partly owing to that identified with the name of Westinghouse. Everybody has noticed large light houses that are put up and to outside walls here wherever they are used. These are incandescent boxes. The current from the dynamo

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level, there is a vacuum, and  
 the carbon thread is drawn  
 up to the surface of the  
 air is exhausted, and it is  
 to the air for the finish part of  
 it would burn away and dis-  
 it glows, though, in a vacuum,  
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 people trapped with for years  
 are light, where two protons are  
 and point to point, nearly touching  
 the carbon burns away in the  
 light, heat, and the consump-

passing through it." If a current is passed through a sliver of copper with heating, takes place, as it gets through steadily. In good conductors the energy of a current tends to be destroyed by the resistance. As the destruction of energy, however, is an impossibility, it transfers itself and appears as the energy heat. In the early days of electric lighting, incandescent platinum wire were used. Platinum is a bad conductor, and glow

[illegible][illegible]

man flew. My company certainly had  
 the patent on one of the earliest lamps giv-  
 ing light to the world. But it was very crude  
 and inefficient. Instead of a filament it contained  
 a piece of carbon, which burnt in a partial  
 vacuum and was covered from time to time  
 with a new one. It seems as if the first  
 lamp contained like excellent principle  
 of the modern lamp. The real ques-  
 tion at issue before the courts seems to be  
 very peculiar one. Indeed, it is this  
 question: taken out in a foreign  
 country before the courts for explana-  
 tion, that the Edison Company  
 has some old patent or other right  
 taken out in its first patent. It was  
 material that it was, I think, the  
 term for a patent is very short. If the

company's "office" above that the "patent" must run for the period allowed in this country the Edison case must fall together.

Ex-Senator Evarts' own charge of "well-known" fact in the Edison case is that he so long now here in support of the "well-known" fact that he adopted some of the tactics of looking up a test or valid here. He is not to have found one in the judgment given in the case some refrigerator patent in the case for upon his point. The general up of electricians here seems to be that he will not gain a verdict. To give the result, however, it will be of great importance to all persons, as will not set at rest once and for all, some high class respect of the patent law.

News, Chicago, Pa. Dec. 2

### A. ELECTRIC CHROMATOGRAHY

**A Big Legal Battle Over Incandescent Lighting.**

The Westinghouse Electric Lighting Company, of Pittsburgh, and the Thomson-Houston Company, of Boston, which were recently combined, have just commenced an engagement with the Consolidated Edison Lighting Company, of New York, which regards its electric lighting circles as the most important movement of recent years. The three corporations have been practicing consolidated, and will at once begin a battle with the Edison Electric Lighting Company for the absolute control of all incandescent plants now in the city.

[illegible]

Several months ago, before this combination occurred, the Edison Company introduced four cents in the cents in Pittsburg to the Keytone Company from using the Edison record system, claiming that it was Mr. E. J. Keytone's invention and protested by the patent laws. The Keytone Company at that time refused to pay the cents to the Edison Company, and the Edison Company refused to play the record to show its right to the use of the Edison system. The court agreed with the Edison Company and has not since been reversed. Recently the local Edison Company has been ordered to pay the Edison Company the cents based on the Edison system.

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Westinghouse Company  
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Times, Pottsville, Pa.  
Aug 3, 1888

## THE FIGHT FOR SUPREMACY

Dispatch, Pittsburg, Pa.  
Sept 20, 1885.

## BEAT ITS COMPETIT

The Westinghouse Electric Company Will  
Light the West 600, Chicago.

The Westinghouse Electric Company, of this city, was awarded the contract yesterday for furnishing and installing the lighting for the West 600, Chicago. While the contract is not so large as some others, it being secured by the Westinghouse Company is rather significant from the fact that it is the greatest order of the kind in the competition of electric concerns and that every firm in the country that has had a hand in the above-named contract.

The Westinghouse Electric Company will begin the work of putting in a plant, including boilers, dynamos, wires, etc., tomorrow morning at 8 o'clock, and will be on the job till dark. This Chicago concern will be known as the Consumers' Electric Light Company.

## EDISON'S PATENT INVALID

**A. DROISION IN THE SUIT IN  
"THE ENGLISH" COURT.**

**HOW THIS RULING WILL AFFECT THE  
SUITS PENDING AGAINST THE EDISON  
COMPANY.**

A cable dispatch from London yesterday stated that Judge Kay had rendered a decision against the Edison Electric Light Company, in favor of the plaintiff, the City of London, in a suit for an non-inducement lamp is invalid. The action in this case was brought by the Edison Company against the City of London, which had refused to license, but in reality against the Anglo-American Trust Electric Light Corporation, Limited. Holford had used lights furnished by the Anglo-American and General Electricity Companies, and when the lamps were made by the Anglo-American Company, the latter company gave a license to the City of London. The court found for an infringement of its own as well as

[illegible][illegible][illegible][illegible]

newly to the United States and even on salaries. The Government has no question regarding the propriety of the proposed salary in all countries. Indeed, a statement in regard to the salary of the United States has been made by the United States upon the Cheesbrough patent. The Government has no question regarding the propriety of the proposed salary in all countries. Indeed, a statement in regard to the salary of the United States has been made by the United States upon the Cheesbrough patent. The Government has no question regarding the propriety of the proposed salary in all countries. Indeed, a statement in regard to the salary of the United States has been made by the United States upon the Cheesbrough patent.

## ELECTRIC LAMPS

The Recent English Decision. In the case of Edison v. Edison, the decision is in favor of the Edison Electric Company. The decision is based on the fact that the Edison Electric Company is the owner of the Edison Electric Company, and the Edison Electric Company is the owner of the Edison Electric Company. The decision is based on the fact that the Edison Electric Company is the owner of the Edison Electric Company, and the Edison Electric Company is the owner of the Edison Electric Company.

[illegible]

of the promoters in getting a foreign railroad to the same thing. In a natural death, dragged the patent with them. On the British patent, a powerful monopoly had been reared out just in England was brought. The million came to the attention of the flyers of the past across to there was Harry, an Ohio man, in 1857. Age has twenty-five years, of the and the and the patent of 1816 patents usually on conductors intensely heated by the current of electricity for the purpose of vacuum," continued in a vacuum.

"That came the work of Moses O. Nestor of Amesbury, electrician, in his house with incandescent, lamp, took over the researches of the vacuum, and in 1870, in the same time. In June, 1870, appeared patent in New York and also, in 1871. It is now at the present time, a high vacuum, could cause to beat carbon conductors decrease in a vacuum, and in 1871

ment. And then came another incident in December, 1928, in which the lamps in actual operation.

"The claim is a monopoly of the lamp, and a claim for a burp," says the Court, "considering how had invented." Having thus disposed, the English Court

so called: "Cheesborough post barrow hinged the other

In January, 1870, Messrs. Sawyer and Ellis obtained an American patent for a swinging lamp, the same as the one in the case. This was one of the things, because upon it depends the operation of all forms of incandescent lamps, with one exception—now in use. It is obtained directly, as by the charming substance, is not uniform in the light, it is uniformly hard. When the lamp is turned through it, it becomes a

practically useless. But carbon in the form of a coal has been well surrounded by a highly inflammable gas, which is itself a body of intensely hard, compact carbon admirably adapted for burning, and which can be handled for miles in the form of a gas. In England in the name of *thermo-gas*, and that patent has been granted to the United States the claims of *Max* & *Max*, shortly after their patent, was challenged by the *Edison* & *Edison* electric-lighting system of the same four years. Edison in 1879 was a year or two originally invented and actually went through process some two years. *Sawyer* and *Man* had thought of the idea of a gas lamp, but *Weston's* favor, and broader to him the inventor in his present scheme.

The Western Union Telegraph Company  
New York, Dec. 24 - Will  
have sold a Star reporter  
the rights to publish the  
company's secret code book.  
The company has refused  
to enter the Village Justice

100

**ELECTRIC**

**"A WEATHERING ELECTRIC COMPANY"**

**"A FANS ISSUE A CIRCULAR."**

The Details of the Edison System Plainly Shown in Several Pages—A Good Proposition Made to Replace all of These Edison Electric Light Systems by the Edison System of the Weathering Electric Company.

The "Weathering Electric Company," of this city, under the date of yesterday's issue of the *Advertiser*, has issued a circular which it seems to send to all the users of the Edison electric lighting system in this city. It contains a full and complete description of the Edison system to replace the plant with one of their own, and also states that they will give better results on the investment will be obtained. With this circular it is encased a copy of the circular issued last year—"confidential" circular of the Edison Company was printed. The Weathering Electric Company is located at No. 107 North Main street.

[illegible][illegible]

**Trying to Invalidate Edison's Patent.**  
OTTAWA, Nov. 12.—The Minister of Agriculture will to-morrow hear the application of the Royal Electric Company of Boston to invalidate the Edison patents for incandescent lighting in Canada held at present by the Edison Electric Light Company of Montreal. Experts from New York and Pittsburgh will be present for both sides. Generalities will be said but the question is whether the patent is valid for the manufacture of the bulb in Canada.

Nestor of American electricians, in his house with incandescent lamps glowing over the researches of the Russian, Kinnu, and Kostoff, to common times. In June, 1878, appeared a patent of Sawyer and Man, in which it is not now at the present to produce a light by causing a current to beat on carbon conductors in a vacuum, and in his little house, in the corner of the city, he has a small laboratory.

to the Sawyer & Man Company says is to be sued, and that he has no doubt of the result."

*Argus-Leader, Sioux Falls*  
Dec. 24, 1892.

The Westinghouses Will Not  
New York, Dec. 24.—George  
inghous told a Star reporter  
Westinghouse Electric Company  
not enter the Villard-Edition av

Chicago, says that according to its circular, box 103 is in operation. The Westinghouse Electric Company did not begin until 10 months ago—January, 1907, and has installed up to date equipment. The proposition which the Westinghouse Electric Company makes to the users of the Edison system begins with a statement about the efficiency of the latter system, in conjunction with the improved lamp that is now manufactured. The complete knowledge of the Edison lamp and the recent improved model of the same is given, whereby its efficiency is greatly increased without a corresponding diminution of life.











1







Republic, St. Louis, Mo. Jan'y, 1889.

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mer - Gazette, Pittsburg, Pa.

## VICTORY SCENTED

An Anticipated Bonanza for the  
Edison Electric Light Company.

## A SUPREME COURT DECISION

The Washington and Other Corporations  
May Have to Pay Royalties on Incan-  
descent Lamps—The Phonograph

\_\_\_\_\_

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Pres. N. Y. Jan'y 25, 89.

July 22, 1889.

**AMERICAN INVENTORS' RIGHTS.**

THE RELATIONS OF AMERICAN AND FOREIGN PATENTS DETERMINED.

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Inquirer, Phila. Co.  
Jan'y. 26, '89

## ELECTRIC-LIGHT PATENTS.

## Effect of the Bates Decision on the Westinghouse Company.

## NOT A SPECIAL VICTORY FOR EDISON

**United States Electric Company Purchased by the Westinghouse, With All its Valuable Rights and Patents.**

Dispatch, Pittsburg, Pa.  
Jan. 25. 89.

**UNA PANIA IN ELETTRICO.**

Something unusual happened at the Stock Exchange yesterday. A report that the Supreme Court had rendered a decision adverse to the electric utility companies caused a sharp rise in the price of the stock of the Edison Electric Power Co. of New York.

dumped about all they had upon the market. Bidders of big bundles looked on, smiled and

Dispatch, Pillsbury, Pa.  
Jan. 25, 89!

SECRET OF THE GOVERNMENT

The Westinghouse Electric Company, on Wednesday, gained the control of the United States Electric Light Company, and the Edison companies in one move.

This concern is one of the oldest electric businesses in the country and it has

Times, Vauxhall Rd, 7  
Jan'y. 24, 8

The decision of the United States Supreme Court on the limits of

decisions rendered during the years. It has been held by our that a patent right granted to

... of a potent abroad, is limited  
in this country, to the time

Press, Pittsburg, Pa.  
Jan. 25 1889.

States **MAKING THE SPARKS**

THE RECENT DECISION OF  
THE SUPREME COURT  
ON PATENTS.

quences—Mr. WASHINGTON

Advertisements Below.

THE

ITS GREAT IMPORTANCE  
ELECTRICAL PATENT

It will be Apt to Mean a Great Deal  
son, and Quite as Much to the

Jan 24, '89.

IN

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are





## VICTORY SCENTED

Anticipated Banners for the  
Edison Electric Light Company.

## SUPREME COURT DECISION

The Westinghouse and Other Corporations  
May Have to Pay Royalties on Incandescent  
Lamps—The Phonograph  
Co. Also Affected by the Ruling.

Co, Also Affected By the Molin

[illegible][illegible]

Globe, Brestow,  
Feb. 2: '89.

Edison has shown that either he or his  
organization is efficient in having  
obtained a termination a long line of liti-  
gation, ending at the Supreme Court of the  
United States. I don't suppose he could  
have prevailed there but for his legitimate  
merits. Undoubtedly the head of all con-  
servators, or animators, as well as of every  
individual apologetic, he has aided  
his time, shown grit and mastered all the  
capital he desired. I went to see him about  
12 years ago, with General Cress, your  
postmaster. It was Sunday, and we  
found him at Monte Park.

[illegible][illegible][illegible]

of his most important defense that now everybody was free to go on and use what he had extended. These devices were intended to null the customer, and consequently a great deal of money has been spent upon various electric lines, which were

**Adaptations and Forwards.**

The man himself has not allowed his personality, to be destroyed by the small personal conflicts. Of late he has kept in the background in the way of interviews. He has had a staff of lawyers, and it was already ahead and

There has not been any considerable change in the attitude of the government toward the natives, except to supply for these people the necessities of life. The government has continued to make the same policy of giving the natives a few dollars a year for the purpose of making them more civilized than they are. The government has continued to make the same policy of giving the natives a few dollars a year for the purpose of making them more civilized than they are. The government has continued to make the same policy of giving the natives a few dollars a year for the purpose of making them more civilized than they are.

and want you to publish it. I don't think I can do so without your aid. I have written some things about the conditions of the Negroes in the South, and I am sure that they will interest you. I am sure that you will find them interesting. I am sure that you will find them interesting. I am sure that you will find them interesting.

Yours truly,  
GEORGE LINCOLN TOWNSEND.

*Journal, Lincoln Neb.  
July 23, 1890.*

Mr. Edison having established his monopoly of the patent to the incandescent system of electric lighting over all competitors in the English courts, refused to give up his undisputed possession of one of his most important inventions. In a recent year in devising and perfecting the incandescent system, and immediately other companies at home and abroad pirated his work and attempted to get patents on it abroad. The English court, which was of final resort, decided that it was a question of fact only, and Edison had no trouble in showing that he was the original inventor. That settled the controversy.

W. J. Wood, July 19. 89.

## DISON WINS IN ENGLAND.

RIGHTS IN THE INCANDESCENT ELECTRIC LIGHT ARE SUSTAINED.

[illegible][illegible]

**Kaiser Disbelieved**

Thomas A. Edison received a cablegram from his solicitors in London yesterday afternoon stating that the validity of his English patent for the electric light bulb had been upheld by the House of Lords and the decision of the House of Lords reversed.

He said the Edison-Lamp Patent had been granted in 1875, and that it was a large business in the world.

He said that a great deal of money had been made by the patent, and that it was a great deal of money that would be made by the patent.

**COMBINING** Consolidation seems to be  
**ELECTRIC** the order of the day  
**LIGHT** among the electric light  
ing interests.

and the United States Electric Light companies have united to form a new corporation to be known as the Edison Electric Power Company.

Not long ago The Standard Oil Company threatened that all the oil companies grouped under the Edison company were to be eliminated into one gigantic corporation.

Interesting question now is whether this new corporation do not force a movement on the part of the monopolists who control the Edison and Westinghouse companies to unite forces in a still larger and more powerful corporation. Those interested that anything of the kind is in fact, but outside of the general trend of the times.

These combinations, there is no doubt, are necessary for such a course in the near or distant future.

As patents and claims of inventors in the field of electric lighting are in a very

and, the temptation to join hands and  
the public control would be nat-  
of electric lighting is the develop-  
of the electric light and the ex-  
the course of development, with the  
Interest.

*Journal Proprietary, R.I.*  
*July 5, 1917*

**THE PRACTICAL NOTES.**

secret details of the United States  
to the Court in the suit of the *Rose Ind-*  
Co. vs. C. H. Hammond &  
the United States Circuit Court of  
the status of which had been in  
in the lower Court, and is here  
the Edison Company as a great  
the United States Circuit Court  
of the United States Circuit Court  
of the United States Circuit Court

[illegible]















74 1/2, Grand Central Bldg., N.Y.

**INVESTMENT OPPORTUNITIES**  
**THE WESTINGHOUSE ELECTRIC COMPANY**  
The Westinghouse Electric Company, through its American Electric Works Corporation, is offering for sale a large quantity of its stock at a price of \$100 per share. The stock is being offered at a discount of 10% from its par value. The company is a well-known and established corporation, and its stock is highly regarded by investors. The company's business is growing rapidly, and it is expected that the stock price will rise in the future. The company is also offering for sale a large quantity of its bonds at a price of \$100 per \$1000 face value. The bonds are being offered at a discount of 10% from their par value. The company is a well-known and established corporation, and its bonds are highly regarded by investors. The company's business is growing rapidly, and it is expected that the bond price will rise in the future.

**WATSON PATENT CASE**  
A GREAT PATENT CASE.  
A WONDERFUL INVENTION INVOLVED.  
The Watson Patent Case is a great patent case involving a wonderful invention. The invention is a new and improved method of... The case is being heard in the Supreme Court, and it is expected that the invention will be patented.

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74 1/2, Grand Central Bldg., N.Y.

**BOTH ACT TOGETHER**  
Washington and Edison Join Hands  
In a Big Electric Fight

**FOR IMPROVEMENT OF PATENT**

A Voluntary Plan of Washington in the  
Draper Header Case

**GENERAL LIAISON OF THE COURT'S COURTS**

An electric litigation commenced yesterday in New York, the result of which will be watched with great interest by all the electric companies of the United States. The litigation is between the Edison Electric Company and the Westinghouse Electric Company. The Edison Electric Company is the plaintiff, and the Westinghouse Electric Company is the defendant. The litigation is over a patent for a new and improved method of... The Edison Electric Company claims that the Westinghouse Electric Company has infringed on its patent. The Westinghouse Electric Company denies this claim. The litigation is being heard in the Supreme Court.

The Edison Electric Company is the plaintiff, and the Westinghouse Electric Company is the defendant. The litigation is over a patent for a new and improved method of... The Edison Electric Company claims that the Westinghouse Electric Company has infringed on its patent. The Westinghouse Electric Company denies this claim. The litigation is being heard in the Supreme Court.

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A GREAT PATENT CASE.  
A WONDERFUL INVENTION INVOLVED.

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April 19, 1889  
Amherst, Mass.

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The Westinghouse people lay great stress on the fact that Mr. Edison's attorneys have secured frequent delays in the taking of testimony which they say indicates that the final result is feared.

[illegible]

Inquirer, Phila. Pat.  
Dec. 22, 1854

The greatest conflict between the WESTINGHOUSE and General Electric systems of electric lighting is now fairly so in the United States Court at Philadelphia. Numerous local companies acting under one or the other of the great leaders are deeply interested, for all the decision of this court may raise the validity of their titles to the territories they occupy. Both contestants are enormously wealthy, both are very much in earnest and the fight will be a fight to the finish, which will doubtless be held in the United States Supreme Court. It is a contest in which no lay opinion has any value; the result will be decided only and how the contest will decide it.

Press, Phila. Pa. May 23, 1888

THE income of the great electric light  
between the Edison and the Westing-  
house Companies, now in progress in Pitts-  
burgh will be watched with great interest  
the public on account of the magnitude  
the interests involved, and for personal  
reasons by those who have money invested  
the companies appearing under either  
patent. The question at issue is the priority  
of invention of the carbon lamp to incan-  
descent lamps. So far as the general pub-  
lic is concerned the result either way will  
be of moment only so far as it may influ-  
ence in the future the cost of this kind  
of illumination.

TO A LAYMAN there is something an-  
nouncing in the claim made in the elec-  
tric light suit now on trial in Pittsburg  
that Sawyer, not Edison, invented the  
carbon filament, used in incandescent  
electric lighting. At the time when  
Edison was displaying his early lamps at  
Cenilo Park, Sawyer was in the city ex-  
hibiting an entirely different form of  
lamp, and publicly declaring that Edison  
could not maintain one of his filaments  
in incandescence for 15 minutes. And  
now, after the lapse of 10 years, his ap-  
pearance (through his associates) as the in-  
ventor of that which he declared imprac-

W. J. Gould, May 22, 1891

in which the validity of the Bell Telephone patent was attacked has been brought in the United States Court at Pittsburgh. It involves the ownership of the patent in the incandescent light which the Edison Company has been manufacturing and selling since 1880; and which now is a very extensive use. The claim is that the patent was granted to BAWDEN and MANN, in 1880, although applied for long before, covers the argument that Edison stands on, and that the Edison Company is an infringer. The Westinghouse Electric Company owns the Sawyer and Smith patent since the Bell. It is difficult to say just how many millions are at stake.

There are many. Is a fight between Edison, as I have said. The tone of the patent is an unrecalled. But one voice in the Supreme Court was lacking to set aside it of West.

Dispatch, Pittsburgh Post  
May 22, 1889


LET THERE BE LIGHT

Westinghouse and Edison Look  
Horns Yesterday for a Week.

LAWYER LOWREY CAUSES A FUSE

**THREE DAYS' TALK TO EASE THE LIVES**

**THE GREAT**  
struggle for the  
ownership of the  
patent, of what  
is continually  
known as the  
Sawyer-Mann  
Washington case,  
Edison-Westing-  
house Counselled  
at Wash.



undescend electric lamp with textile or  
lamp either vegetable carbonized filament in-  
tense in a vacuum which prevents an ex-  
cess of oxygen, begun before Associate  
Justice Bradley, of the United States Su-  
preme Court, and Judge McKenna, of the  
United States Circuit Court, yesterday.  
George Westinghouse was pres-  
ent with ten attorneys, Congressmen  
John Dalzell, T. B. Karr, George H.



*George Worthington, Jr., of this plant*

Christy and George Shires, of Pitts-  
burgh; Edward Wilmore, Hugh R. Gaskin, of Al-  
bany; Leonard P. Currie and Frank  
Pope, of New York; and J. Edgar Be-  
dasto. Edisto was not a student, but  
was strongly represented by Major  
Eaton, B. P. Lowrey, R. M. Eyer, W. W.  
Griffin, F. R. Upton and T. L. Blodgett.  
New York: R. B. Thorston, of Presi-  
dent's Hall, and Magnus Edisto, of this  
city. All ages of the legal profession, from  
silly doctormen to full of firm and strong  
to the veterans of 65, are here to the  
solidness of vast legal knowledge and  
duty.

**A DIVERSITY OF CORNW.**  
While there were no very fat lawyers out, there were small, medium-sized and ones, with asburn hair, black hair, gray grizzled hair and neutral tinted hair, some with but little hair of any kind; mustaches, mutton chops, goatees, full beards and every other kind of facial adornment. A what a pile of documents and patent electric devices they had, and books of treatise



**The Wizard of Monte Park, Defendant.**  
 taken at various hearings before (Commissioners), amounting to thousands of pages in addition to a large volume of all sorts of testimony, note, comment, etc. They appeared like a lot of carpet-baggers, and some not solidified with matches had wooden boxes, in which their tools and other "baggage" were stored. They came in all in all they are evidently a kato body of men, and if an opponent makes a trip he is lucky if he has a shot in the wing." It was decided that the arguments should close on Thursday, giving disputants Friday and Saturday.

The argument for Washington, D. C., and against the proposed new site, was eloquently presented, and that Editor of the *Washington Post* thrust into long letters was in consequence one of the things which have been left behind the scenes. When the *Washington Post* learned that the battle conductor was not to be a member of the orchestra, it was not surprised. It is not surprising that the *Washington Post* should have been so disappointed that the conductor was not to be a member of the orchestra, but it is surprising that the *Washington Post* should have been so disappointed that the conductor was not to be a member of the orchestra.

**APPEAL IMPROVED.**  
Mr. Dabell contended that the circumstances the mar was re-  
sponsible for, and that the  
an appeal could not be taken  
thereof. He claimed that he  
would be necessary to allow \$5  
bills in equity, although the  
shown some doubt on the  
the whole matter, as claimed  
that Mr. Sawyer and Messrs  
respective of all allegations  
G. V. Lowrey, Jr., and  
after making that the gift of  
of Messrs' opinions were  
pieces involved were  
investive, he referred rather  
some admissions to show that  
in the progress of the  
alleged investors had not can  
Mr. Lowrey warned up  
Mr. Dabell repeatedly  
Lowrey, and visited Messrs.

but Mr. Lowrey refused to make any justification, and said on an apology, and asked the Court to allow it to be made, as it had the other side to pass without you, Mr. Wellmore, to be heard and an apology."

[illegible]

W. J. Litcham,

[illegible]

between the "aqueduct," and the "sewer," and the "water" and "sewer" chambers could be so complicated and so sealed and vacuumed that the attack of oxygen, which does attack of lacustrine; that Edith's sending a particular material in a lamp together with electric system which about to be put on a common bar of investment for streets, etc. in the fall of 1911. Invention at Menlo Park, a lamp which is substantially the same as the one used by the plaintiff and the street lamp.

resistance to the passage of air, secured in a glass chamber, sealed with glass, from which the air has been taken out by means of a pump, so that it is in a state of a high vacuum; then the subject he pursued the plan of the experiment, and the employment of what he called the "vacuum chamber," and that in this respect his experiments were exactly opposite to those of Faraday & Man, who sought to show that the air was necessary for the combustion of the phosphorus.

consequently, the same was  
applied to all the other  
given lots, and the value  
of \$50,000,000, whereas, by  
means of the following facts  
was the result of empirical  
at a cost of hundreds of  
opening up to different  
of the same, and the  
available to producing this  
and possessing the high speed  
of the same, and the  
body. The original edition  
published at Manila Park to the  
was over made that Sawyer  
the same, and the same  
papers of December 31, 1870,  
with illustrations of his lamp  
of the same, and the same  
recollections, ten years old,  
the farmer, to wit: That  
certain other form lamp  
the same, and the same  
for a patent. This was pub-  
lished in letters to the au-  
thor, which he declined to  
down in the *AMERICAN* and

[illegible]

**How Edison**  
George Westing-  
A. Edison, was  
for the monopoly  
of electric light of the Un-  
the United States  
Pittsburgh, yesterdays  
ments of Messrs. L.  
York, for the defense  
The proposition  
in general were  
light in 1877, presen-  
tion of Sawyer &  
his revenue of

...electric current, as  
up by fusion of the  
are exhausted to the  
to accomplish this ob-  
resistance in lamps  
called the multipin  
principles and methods  
those of Saw-  
far low resistance

[illegible]

113

[illegible]

1889  
saved his life.  
s. Jr., and Thomas  
ing a legal contest  
the independent elec-  
States, both nat-  
istrict Court room, at-  
tending to the argu-  
ment and Dyer, of New  
York, in the present case.  
Mr. Edison's counsel  
t Mr. Edison began  
the subject of electric  
the professed inven-  
tion, and made use in

led series of experiments and other material that he was from the "bat carton" of some sort, was the most dense incandescent globe, provided the lamp was completely exhausted of gas, and so to main-

[illegible]



170 177 Commercial Digest, Cincinnati, Ohio,  
May 23, 1899.

The following is a translation of the original text, which is a notice of a public hearing on the proposed extension of the electric light and power system of the City of Cincinnati, Ohio, to the village of Colerain, Ohio. The notice is dated May 23, 1899, and is published in the Commercial Digest, Cincinnati, Ohio.

W. J. Ward, Mayor.

THE CITY OF CINCINNATI, Ohio,  
May 23, 1899.

Commercial Digest, July 25, 1899.

THE CITY OF CINCINNATI, Ohio,  
July 25, 1899.

Commercial Digest, July 25, 1899.

**INVENTOR'S DISCOVERY.**  
Claiming to have first used the Edison  
type of lamp.

W. J. Ward, Mayor.

THE CITY OF CINCINNATI, Ohio,  
July 25, 1899.

THE CITY OF CINCINNATI, Ohio,  
July 25, 1899.

W. J. Ward, Mayor.

THE CITY OF CINCINNATI, Ohio,  
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W. J. Ward, Mayor.

THE CITY OF CINCINNATI, Ohio,  
July 25, 1899.

Journal, Cleveland, Ohio,  
July 25, 1899.

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July 25, 1899.

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July 25, 1899.

Journal, Cleveland, Ohio,  
July 25, 1899.

THE CITY OF CLEVELAND, Ohio,  
July 25, 1899.











## THE EDISON PATENT CASE

OF THE DEPUTY COMMISSIONER'S JUDGMENT.

1. **Bob Knock-out for the Edisons-Curafu**  
 Scrutiny of the Evidence--the Argument  
 Dissected in a Mostory Manner--The  
 Judgment is That There has Been No  
 Manufacture, and That Therefore the  
 Edison Patent is Null and Void.

[illegible][illegible][illegible][illegible][illegible]

cost two hundred tons more in Canada, as it requires a special furnace to prepare it; that cost of material in the United States, as reported into Canada, would be in the proportion of one-third, and the labor in Canada, 1/10th.

**The Decision.**  
The judgment is as follows: "The preliminary of the respondents against the question of jurisdiction of the tribunals is that, under the 31st and 32nd sections of the Forest Act, above quoted, the ordinary magistrates have concurrent jurisdiction with the Ministry of Agriculture, and the Superior Court for the Province of Ontario, having been first seized of the matter, the jurisdiction of the tribunals is exhausted and no remedy has been obtained, the Superior Court, in which the remedies originated, being the proper tribunals to entertain them. Upon reading through two lines of the Act accurately, the meaning of the intention of the Legislature is completely comprehensible, and admits of the most intelligent and correct conclusion, that in an action at

[illegible][illegible]

Thus to improve, "the electric  
the patient or that  
without the patient  
examinations would render  
in an action for the  
The process of further ex-  
ator it is introduced into  
an electric current  
vacuum is maintained, so  
the witnesses for the  
Mr. Nelson himself, is in  
or confined in the  
it is not the contrary, it is  
tendent, although some  
ventor, Mr. Nelson, said  
the number 2,451, the four  
which are as follows:  
"1. The method of re-  
flecting the electric rays  
out the condenser, and  
insulating the air through  
driven by an electric cur-  
rent, causing the rays to  
tically excite the gas con-  
for electric lamps."  
"2. The method of treat-

[illegible]

inventive, wily, and still to be feared. He had stolen from Kansas and had been there several years, and he had drawn into wire, and had been arrested, and then sent to the penitentiary.

And that every casual and unimportant part of the bill continues to be, important to the respondent. The special purpose of the bill is to prevent the use of electric lamps, such as that described in the patent.

Two witnesses of 1897 at St. Paul, Minn., testified that St. Vincent Street, preferred by the respondent, was not yet reported, and that, in consequence, as three live bulbs were used, the respondent was in violation of the Electric Act, in that he was not in perfect right to improve the city, and if, after the bill, he continues to think together, the penalty, or consequence, of the bill, is subject to a higher and more favorable section of the Code than the national law, and the respondent thinks that they cannot be.

[illegible][illegible]

was equally of the opinion that the use of an arched form to support wire or tape enclosed in a chamber, known as the "hot box", never having been published in 1948. In the decision he "holds that the form of the filament within the glass enclosure as shown in the drawings is not a new invention, and that the filament is intrinsically so constructed or drawn as to be the filament or tape, and a perfect vacuum such a vessel, used, but that for this reason it is not an invention, and that the filament, although light, may become a fact. The

he has the patient correctly remarks that the case—it may be the person's last work—has the art of practical light. The modesty of the Seamus claims the exquisite of the archetypal life of one of those or textile on as learning that the kingdom is composed of sand all carbon or therefrom would be there.

not equal  
the court intervened  
and the  
of their doing so  
the court intervened  
and the

U. S. Supreme  
is the suit of  
the U. S. Supreme  
Court, Judge Com-  
missioner  
an important  
in the investigation  
of the  
Alibiong  
the complaints  
It is conceded  
Sawyer & Thomas  
as new releases  
swinging sales  
to a U shaped  
were new  
and house-  
hold held that the  
inequality known  
are just now and  
as 1840 by King,  
1876 Court  
1893 Court

that the giving  
the light making  
within the glass  
conductor, is not  
applied before  
ended down it is  
the wire or tape  
may be varied  
in form are old  
section covers  
not fineness of  
its enclosure in  
the globe now  
discovery of draw  
the light giving  
ing would never  
a court does not

INCANDESCENT ELECTRIC  
LIGHTING.

The first thing I noticed when I stepped out of the car was the smell of fresh asphalt and the sound of a city waking up. The morning sun was just beginning to peek over the horizon, casting a warm, golden glow over the scene. I took a deep breath, feeling the cool air fill my lungs. The city was alive, and I was part of it.



#### MISCELLANEOUS SCRAPBOOK SERIES, 1879-1886

The eight scrapbooks in this series cover the years 1880-1886. Four of the scrapbooks contain clippings from newspapers and technical journals and relate to the business and technical aspects of electric lighting and the electric railroad. Also included is one scrapbook containing correspondence and other documents pertaining to Edison's work on electric railroads, particularly the experimental railroad built at Menlo Park. Another scrapbook consists of canvassing reports from Alfred O. Tate to Charles Batchelor regarding central stations in Michigan and Canada. Finally, there are two scrapbooks containing messages transmitted at the Paris Electrical Exhibition of 1881 by an autographic telegraph invented by Edison and Patrick Kenny. All of the books have been filmed except for the two books of telegraph messages.

The following scrapbooks have been filmed:

1. Cat. 2174 Electric railroad correspondence (1880-1883)
2. Cat. 1135 Clippings (1881)
3. Cat. 1139 Clippings (1882-1884)
4. Uncataloged Canvassing Reports (1884)
5. Cat. 1138 Clippings (1885)
6. Cat. 1140 Clippings (1885-1886)

The following scrapbooks have not been filmed:

1. E-5478-1 Telegraph messages (1881)
2. E-2546 Telegraph messages (1881-1882)



#### A Note on the Filming of the Miscellaneous Scrapbooks

Although each scrapbook page is represented on the microfilm, the contents of the scrapbooks have not always been filmed in their entirety. Many scrapbooks contain oversize clippings that cannot be completely unfolded without obscuring other clippings. Moreover, it is not uncommon for many successive pages in a technical journal to be pasted onto a single scrapbook page. To have filmed the clippings in their entirety would have required several additional reels of microfilm.

Each scrapbook page has been filmed at least once, in such a manner as to convey the greatest amount of bibliographic and substantive information about the clippings on the page. Substantive clippings that are directly concerned with Edison and his inventive or business activities have been filmed in their entirety.

Scrapbook, Cat. 2174

This scrapbook covers the period April 1880-November 1883 and contains correspondence and other documents relating to Edison's work on electric railroads. Most of the material pertains to the experimental railroad constructed at Menlo Park in 1880. Included are equipment specifications; cost accounts; progress reports from Charles T. Hughes, the engineer in charge of the railroad; and an agreement between Edison and Henry Villard for the construction of a longer, improved railway at Menlo Park. There are also letters concerning proposed electric railway systems in the United States and elsewhere; agreements pertaining to the rights to Edison's railway patents; a report by Sherburne B. Eaton summarizing ownership of European rights to various railway inventions; and newspaper and journal articles relating to the electric railways of Edison and Stephen Dudley Field.

The material in this book was removed from Edison's files and assembled in scrapbook form by William J. Hammer in the spring of 1898. The documents were used by the General Electric Board of Patent Control in patent litigation and were returned to Edison on May 9, 1902. The scrapbook was disbound prior to microfilming. The material was filmed as arranged by Hammer.

Related material can be found in the "Railroad - Electric" folders in the Document File Series.

Oct. 2194

This binder contains various papers, contracts, files of correspondence, specifications and estimates for railroad material, having a direct or indirect bearing upon Mr. Edison's electric railroads at World Park in 1885 & 1891 and 1892 & 1893, as well as data regarding prospective installations on the Northern Pacific R. R., Manhattan Elevated R. R., Staten Island, Pennsylvania R. R., Switzerland, 1894 America, Cuba, and elsewhere. It contains also the Edison-Villard contract; the Edison-Biedermann contract; Electric Railway Co. of the U. S. agreement, etc. etc. These papers were taken by William J. Hammer from Mr. Edison's private archives at the Edison laboratory in Spring of 1898 by permission of Mr. Edison for use of the Board of Patent Control in the Simon's case, and returned by William J. Hammer to Mr. Edison's laboratory on **MAY 9<sup>th</sup>**, 1902.

Oct. 2174

This binder contains various papers, contracts, files of correspondence, specifications and estimates for railroad material, having a direct or indirect bearing upon Mr. Edison's electric railroads at Coney Park in 1885 & 1881 and 1882 & 1883, as well as data re ending prospective installations on the Northern Pacific R. R., Manhattan Elevated R. R., Staten Island, Pennsylvania R. R., Switzerland, So. America, Cuba, and elsewhere. It contains also the Edison-Villard contract; the Edison-Biedermann contract; Electric Railway Co. of the U. S. agreement, etc. etc. These papers were taken by William J. Hammer from Mr. Edison's private archives at the Edison laboratory in spring of 1898 by permission of Mr. Edison for use of the Board of Patent Control in the Siemon's case, and returned by William J. Hammer to Mr. Edison's laboratory on **MAY 9<sup>th</sup>**, 1902.

# Cost of Motive Power & Lighting Manhattan Ry.

month of April 1880.

Motive Power		1 <sup>st</sup> Ave	3 <sup>rd</sup> Ave	6 <sup>th</sup> Ave	7 <sup>th</sup> Ave	Total
Engines Running & Expenses	Coal	576144	1442101	1084076	542046	3584369
	" delivery of	50467	116009	76411	19102	261989
	" weighing & hauling	426	109216	97526	162	265722
	Oil	41027	93752	121082	40302	296164
	Tallow					
	Waste	8102	21933	27831	4017	61883
	Hard & Coke	12	8250	150	75	31950
	Water Tax	270	720	630	180	1800
	" Expenses	58213	61625	246	17637	160075
	Other Supplies	2045	27463	27892	3597	60997
	Dispatchers & Ckrs.	265	287	328	180	1060
	Engineers	4719	920882	924093	256780	2573453
	Firemen	260211	573895	580357	148102	1552265
	Hatchmen			129		129
	Other Labor	94797	264150	183122	39452	531526
Engine Repairs & Renewals	Boilers	4622	103	54086	4393	73301
	Stacks	2577	8652	26801	1405	39375
	Tire boxes	771	1609	3654	8424	14458
	Bearings	9068	101109	1541	8371	272648
	Brakes	4027	28882	25391	2753	61053
	Brake Shoes	7348	33604	18104	8212	67268
	Wheels		256	11227		11483
	Drivers		42	1064		5264
	Trunk Lines					
	Tires turned down		4227		550	5077
Other Repairs		24560	239068	335446	53216	652790
		115100	1111487	3401213	1212062	1693750
Number Engines in use		28	65	44	23	160
Lights & Lighting & Chang.						
Trains Stations		31127	50997	111853	9287	203266
		63831	116733	101869	7026	220259
		94956	167730	213722	17113	234516

W. H. RILEY  
May 28

## THE ROCKAWAY

### Elevated Rail-Road Company.

Office 105 BINE STREET, New York.  
Removed to 196 Greenwich Street.

W. WILLSHIRE RILEY, Pres.  
EDWARD F. FARRAND, Vice Pres.  
FRANK A. BARTHOLOMEW, Sec. & Treas.

J. H. Edison Esq.

New York, May 28<sup>th</sup> 1880  
Write to say cannot go  
into building apparatus  
yet - the apparatus for Road  
is nearly for experimental purposes  
I can do nothing to help you

Electric Motor last I said my time for carrying out  
until our experiments are completed.  
To my self and friends that we have determined  
to introduce it upon our Road at Rockaway  
Beach, provided you will adapt one to it  
and can construct one in a short time, and at  
a reasonable cost, our cars will be light that  
45 passengers, and probably three in a train one  
grade and not be over one foot in a hundred  
and one line at present not more than half a  
mile in length, our location for bringing both of  
the inventions before the public, cannot be postponed  
Will you please inform me how soon you can  
construct one a motor and its probable cost  
at your earliest convenience, and oblige yours

P.S. State the size of the  
carriage to run on the  
R.R. Co.

Most faithfully

W. H. RILEY

3 Part of the R. E. R. Co.

THE EDISON ELECTRIC LIGHT CO.  
20 NASSAU STREET.

New York

June 8<sup>th</sup> 1880

My dear Edison

I have arranged  
to take Milquiford &  
McNair of the Elevated  
RR<sup>o</sup> to meet by the  
1 P.M. train on Thursday  
I think Metavarro  
will go also - I want  
the RR<sup>o</sup> in good order  
& don't try to break  
anybody's neck -

Yours truly  
Gould

(Letter Book (B) Edison Laboratory, Orange N.J.)  
(Page 125)

W. H. Patton Esq.

June 29 - 1880

Virginia City Nev.

Dear Sir

Your favor of the 8th was duly rec'd. I have  
my system of transferring power perfected  
shown in operation here an Electric railway  
3/4 of a mile long 20 horsepower applied  
gives 13 1/2 H.P. available at the extreme  
end. Roughly speaking if it was desired  
to translate 700 H.P. into Virginia from  
the Carson River, say 6 miles there would  
have to be applied to the apparatus at  
Carson River 1000 of them no loss on  
the conductors but this loss may be great -  
or little according to money invested in the  
copper conductors. Perhaps 80 H.P. would be  
the loss although the exact estimate can be  
made, this would call for 1080 H.P. giving 700  
H.P. available for use in 1 or 100 places  
in Virginia City without material loss by  
sub-division. To carry 1200 H.P. from Lake  
Tahoe to Virginia City is a perfectly practical  
scheme and would pay big.

Very truly, J. A. Edison

(Graft Hammer June 1st 1880)

Note subsequent letters refer to pumping  
devices, hoisting machines & diamond drills  
operated by electricity see Pages 222-283



W. J. Hammer  
ms. 95

R. F. Butler letter

Doston, Mass.

July 7. 1899.

My Dear Edison:-

I have seen Mr. M<sup>r</sup> Mahon and talked with him about your dynamo motive power for the propulsion of railroad cars, and am very much interested in it, and can have no doubt that anything you say is feasible, is feasible, although it is very wonderful to me.

I should be glad to aid in introducing it with my friends in any way that I can.

I am about going away, and J. J. McDevitt Esq. who is concerned with me in business will be in New York, and if you desire to have any communication with him Mr. M<sup>r</sup> Mahon can reach

him.

I am,

Yours truly,

Wm. H. P. H. H.

Thomas A. Edison Esq.

Menlo Park,

New Jersey.

WINDSOR HOTEL.  
57 AND 59 1/2 ST. NEW YORK.  
HARRIS, WAITE & WETTERBERG.

M. J. H. [unclear]  
[unclear]

New York.

Monday - 12 July  
1880

Friend Edison

As I have a few minutes before my train leaves for Boston. cannot let the time pass without a few sentences my report to you into the Rail Road business with you and Mr Blomfield = we talked it over all the way in on the train in fact Mr Blomfield and I reached Fifth Avenue = He is coming out Friday next = This enterprise ought to make you all the money you wish as well as ~~much~~ for Banker, and I pay we will furnish all the money for repairs for your experiments for the principle of carrying steel

WINDSOR HOTEL  
571 AVE. 40TH & 47TH ST. NEW YORK.  
HAWK, WAITE & WETHERBEE.

at your service, I am confident  
we can push its development  
as rapidly and profitably as  
any one, and it only gives the  
chance we throw off our coats  
and go in - we are both sufficiently  
hardened up to place it where  
it belongs. Barker is an excellent  
man and can reach the great  
capitalists as well as any man  
in New York. I can act as "the  
Lieutenant" I trust Mr. Barker  
will arrange with you in this way  
and start the Race Power through  
his energy. Many thanks. Around  
the world.

Respectfully Yours

Charles H. Allen -

McKinnin  
July 27

34 William Street  
New York July 27<sup>th</sup> 1880

J. A. Edison Esq,  
Menlo Park,  
N. J.

Dear Sir:

Enclosed you will find some questions  
on your Electric Railway & Electric Light &;  
which you will please answer as soon as  
convenient to you.

Being obliged to send these informations to  
Venezuela & Colombia, in about a week,  
I hope, you shall be able to let me have  
them before this time.

If you wish to know something in regard  
to these countries, I would be very glad to give  
the data you desire.

Yours, respectfully,

J. McKinnin M. E.

Care of Messrs W. de Castro & Co.  
54 William St.

P.S.

Have you received a letter, with an enclosed sample  
of black sand, mailed to you about two weeks ago?  
If so, please let me know the result.  
yours

*Mr. William*

Mr. William Crooks

New York July 27<sup>th</sup> 1880

## Electric Light

- 1<sup>st</sup> How many candles is equivalent this Electric Light produced by S.H.P. converted into electricity?
- 2<sup>nd</sup> In test of the different electrical machines, constructed for this purpose stating the number of H.P. that they can convert into electrical fluid. One Engine 7000 B.H.P. converted into 120000 candles of 16 Candelas each
- 3<sup>rd</sup> The velocity of each machine, the total weight and the number of pieces above 200 lbs.
- 4<sup>th</sup> Prices of lamps, wires, etc.
- 5<sup>th</sup> Can these machines be taken apart without any damages - yes and can be made to go on mile back.

## Electric Railway

- 6<sup>th</sup> What is the weight of rails per yard and how far apart the sleepers must be placed - weight rail here is 16 lbs.
- 7<sup>th</sup> What is the gauge you consider the most convenient for mountainous countries. Should think 3 foot gauge
- 8<sup>th</sup> What is the maximum grade & the minimum radius of curves. 30 foot radius can draw 5 cars of 4 tons each
- 9<sup>th</sup> How many cars to each train, what dead weight & what load. as 5 cars maximum, use electric brakes on main line, but on branches use a lagover, as no permanent braking required
- 10<sup>th</sup> What is the distance of stationary engines & how many H.P. each station should be about 10 miles apart but each fueling station should be about 5 miles apart.
- 11<sup>th</sup> Price of iron material for 1 mile of railway, of stationary engines, whether water or steam power, of electrical machines,

locomotive, cars, etc. -

Q2

*Yours*

Q3

12th What is the price of your machines for extracting gold from black and yellow sand?

13th Have you invented or do you know of any machine to work gold ore, after they have been treated in the ordinary way with water?

Total cost even money, but with the usual interest from people  
all right - price of freight about 100

Price of Research machine, can be made of gold

machine made, complete to 1500 for the day machine

when complete will be useful to you for gold

machine, all the gold in the world

machine, all the gold in the world

machine, all the gold in the world

machine, all the gold in the world

machine, all the gold in the world

machine, all the gold in the world

machine, all the gold in the world

machine, all the gold in the world

machine, all the gold in the world

W. J. Harrison  
July 24 1880  
THIS IS CORNEILL  
STEWART  
TREASURER

THE EDGAR THOMSON STEEL COMPANY, LIMITED.

BRANCH OFFICE, NO. 48 FIFTH AVENUE,

Pittsburgh, July 24/80

J. A. Edison Esq  
Mentor Park Rd.  
Cincinnati.

Referring to your enquiry  
Mr. Hunt will you please inform us  
what delivery you require - if the  
rails are not needed within next  
thirty days or so we would be glad  
to make you a quotation.

OK You trust  
M. J. McNamee  
~~Not needed for~~  
6 months

J. A. E.

We are making  
some estimates for  
carts in South  
American & would like  
the present market price of logs given  
although we should not need logs for



My Hammer  
and  
Screwdriver

Bureau of  
Railroad Construction and Post Service  
James C. Green,  
Inspector General

Executive Office

Western Union Telegraph Company

New York, August 2<sup>nd</sup> 1882

J. A. Edison Esq

Dear Sir:

I desire to call on you with a party of Brooklyn Gentlemen the promoters of the Brooklyn + Atlantic Beach Elevated R.R. with a view of examining your Electric Engine. Will it be agreeable to you and can you be present on Tuesday Evening (August 3<sup>rd</sup>)

Very truly yours

B. F. Kier House

Answered  
Yes

*W. of House*

THE EDGAR THOMSON STEEL COMPANY, LIMITED.  
BRANCH OFFICE, NO. 48 FIFTH AVENUE,

THOS. M. CARROLL,  
D. A. STEWART,  
CHAIRMAN.  
TREASURER.

Pittsburgh, August 3rd. 1880

T. A. Edison, Esq.,

Menlo Park, N. J.

Dear Sir: Your favor of 31st. ult., received. The rails of section required by you, might be quoted at about \$75.00 as the present market price.

Yours truly,

*J. M. McNamee*  
Chairman

*file E. RR.*

John A. Warner  
General Manager  
Cable News Service  
New York Office  
100 Broadway  
New York

P.O. Box 1836.

Porter, Quincy, Loren & Shinn

Managers & Counselors at Law

No. 3 Broad St. New York

Aug 7<sup>th</sup>

1880

My dear Edison I have now returned & am prepared to go on with R.R. matters. It will be more useful at first to have a meeting with Villard, Fabbi & perhaps Lavarro & that will be best managed here - What do you say to Thursday or next week? Fabbi is not here on Wednesday - on Monday Tuesday the Glendale R.R. arbitration will keep me.

Let me know about the hour

Fabbi asked me this morning if there was any discrepancy with Italy in Italy out or rather paying for foreign patent etc - He said he understood from someone that he was going to take out the English R.R. patent - If, Rongt is they are interested in that form of law what the Electric Light Co set here - i.e. the same for England & etc

Not Company get here<sup>2</sup> - that the taking out of  
 any separately, would possibly lead to disputes  
 + differences for which there is absolutely no  
 access - but which thing may a foot inter-  
 fere with successful business - I am sure  
 you will do best to stick to your present  
 relations - If you don't want any of the  
 plant to be considered as coming under  
 your agreement with D.H. Co. you can  
 specify them & they can be held separate  
 until the matter can be determined - The  
 cost of course common and full facilities  
 + remedies that any one can

Edw. W. May 28  
 left Albany  
 a day ago

will come on  
 Thursday if you will  
 say what time I have  
 not made any arrangement  
 with Colly to take  
 our part in Eng on 1st  
 I will not do anything  
 to disturb your plan  
 for all in any way  
 for all I do now  
 this note  
 I have been anything  
 as you wish that G.P.

Blacke  
 G.P. Foxey

OFFICE OF  
JONES & CO.,  
PINE AND HARDWOOD LUMBER,  
35 BROADWAY,

New York, Aug 7th 1880.

Mr. J. H. Jones  
N. Edison Esq

Dear Sir

I hold  
a patent for a lapped & joint,  
that presents a continuous bearing sur-  
face to the wheels, & to all intents and  
purposes secures all the advantages of  
an endless rail. The object of this  
note is to ask permission to put down  
a section of track upon your private  
road, with an ulterior view of giving  
you an interest in it, provided  
it meets with your approval.  
If you will advise where it will be  
convenient to give me ten minutes  
of your time, either in Muelo Park  
or in this city it will oblige me.  
Yours truly  
J. H. Jones

OFFICE OF THE  
S. D. MUNN  
& E. BEACH  
N.Y.C.

Write Hopkins that we are going  
to design factory for out-fits  
Scientific American  
conferences, etc. say to have  
first-hand info. to make  
our price correct so as to  
New York Aug 14 1880  
go up the 850 foot grade

Mr. T. U. Edison

Dear Sir

If your lamp  
works are in operation  
we would like to make  
sketches of them as well  
as other things for a large  
cut. If it will suit your  
convenience I will come  
over on Thursday or Friday  
and bring Mr. Mead our  
artist. Please reply by

return mail card  
obliga

Yours truly  
Geo M. Hopkins

*M. G. Hayes*  
*Sept 1880*

M. G. HAYES, GENL. SUPT.

THE

T. CRAGIER, AGENT.

# New York Steam Cable Towing Co.

OFFICE, No. 14, ERIE STREET.

Buffalo, N. Y. Aug 30 1880.

Thos A Edison Esq  
Hunts Park

Dear Sir.

I have just received a letter from Mr Carrizal one of those Cubans, in relation to the six telephones you were to send him.

It seems from his letter that he has not received them, will you please have some one look that matter up and ascertain the cause, judging from his letter I think there is strong prospects of your Electric R.R. being layed between Marianas and La Playa, I expect to be home in about a week and I will explain more fully,

I have had my hands full since I have been here, and have had to remain longer than I anticipated, I shall leave here to morrow for the 2<sup>d</sup> Div<sup>n</sup> of the Canal to attend to some work there



and shall remain in Syracuse  
three or four days, if you want  
any information relating to the  
Canal, address Windsor House, Syra-  
-cuse, Yours truly

Yours truly  
Jas McSweeney

Ernst

MS Band

Phyllis, Mary-Jane

M. J. Hammer  
Sept 9<sup>th</sup>

Samuel Wallace & Co.

25 47 Broadway

New York Sept. 15<sup>th</sup> 1880.

Mr. Edison Esq  
Crescent Park St 3<sup>rd</sup>

Dear Sir

I pray you will excuse  
me for troubling you as your time must be  
fully occupied. But I have always been a  
staunch advocate in Electric Power for general  
use, and I desired to learn how far you had  
advanced in its use for propelling and running  
cars on Rail Roads also to be informed how  
satisfactory your experiments have been, and  
whether your test have been sufficient to prove  
to you that this Power can successfully compete  
with Steam in propelling Railroad Cars its feasibility  
for this purpose, and any further information you  
may be pleased to give me. My object is one  
which may prove of service to you. I trust if you  
are not hampered by the use of your invention  
I may be able to help introduce it  
trusting to receive an early reply as your time will  
admit I remain

Yours Truly

E. F. Mearns

address as above

47 Broadway

M. J. Hammer  
Nov. 96

My. 12 Wall Street  
Oct. 16. 1890

My dear Sir

In view of the near  
opening of our Great International  
Exhibition, where I think is now almost  
determined that I will make proposals  
(which is then, I hope, one of our City's  
Chief business matters), of a special  
continuous Island - Path - between  
Tongue Point Road & Weymouth - if some of your  
Excellencies find it desirable; what  
arrangements would you make for  
their adoption of your suggestions  
R. Road & from? And what else, please  
would you give me for the purchase  
from? As I cannot & cannot from there  
I could assure complete success.  
Please call or write me without delay.

Sincerely,  
Thos. A. Edison Esq. Robt. Dodge

*[Faint handwritten notes, possibly bleed-through from the reverse side.]*

Newspaper Articles  
1880 Railway.

Name of paper and date

or portions marked.

Copy the following articles, ~~marked~~ - 2 copies, long paper.

~~W. J. Proctor, Aug. 9, 1880.~~

+ Page 49 - ~~Edison's~~ Edison's  
An Electric Railway. \* \* marked part.

+ Page 10 - The above abstract has appeared in the  
N. Y. Daily Chronicle, Aug. 12, 1880.

+ Page 57 - N. Y. Herald, May 15, 1880.  
Edison's Electric Motor. - whole article.

+ Page 57 - Sci. Am. June 6, 1880.  
Edison's New Electrical Railway - whole.

+ Page 61 - N. Y. Herald, July 24, 1880.  
The Electric Motor. - whole.

+ Page 62 - N. Y. Herald, Aug. 5, 1880.  
Electric Traction.

+ Page 63 - N. Y. Herald, Aug. 10, 1880.  
Minto Park. - marked part.

+ Page 64 - N. Y. Herald, Aug. 6, 1880.  
Field & Electric Motor. - marked part.

Page 64 - N. Y. Herald, Aug. 10, 1880.  
Electric Traction. - marked part.

Page 68 - N. Y. Herald, July 27, 1880.

Hammer's Blue  
Script Book,

There are also other  
articles - see Field Case.

New York Herald, May 15, 1880.

#### EDISON'S ELECTRO-MOTOR.

Experiment with the Electro-Locomotive on the Menlo Park Railway—an Accident prevents a satisfactory test being made.

For sometime past Edison has been engaged in perfecting an electro-motor to ~~xxx~~ be used in countries where the traffic would be insufficient to pay the interest upon even a narrow gauge road operated under the present system. The engine consists of a simple four wheel truck on which a dynamo machine is placed. An armature revolves just as in obtaining the electricity for the lights, but a system of gearing is used so that the armature may work perfectly independent of the car wheels, enabling the operator to use as much power as he desires. The line of railroad at Menlo Park is a little over a half a mile in length, and has some very sharp curves and steep grades. The system on which it works is as follows:— The electric engine receives its motive power from a large steam engine at the station, but before the power is used it is turned into electricity, which, passing through the rails, supplies electricity enough to run the motor or draught engine. When the road would be laid for practical purposes there would be a station every ten miles from which electricity would be supplied for five miles on either side. The power of the machine at each station would be sufficient to run several trains at the same time on the section. Mr. Edison claims that all the movements of trains on each ten-mile section are controlled absolutely, and that crossings and switchings can also be done automatically. It is intended that each train will carry 50 tons of freight, or from 200 to 300 passengers. The cars, Mr. Edison says, will have the same ~~xxxxxxxxxxxxxxxx~~ lightness as street cars, hence the dead weight will be small, so that more freight can be carried. The average speed of the freight trains will be about 12 miles an hour, and passenger trains 20 miles. The motor or engine used in drawing the cars weighs about two and one half tons. The road can be laid in mining or agricultural districts wherever a wagon can pass, as little or no grading need be done. The traction necessary to ascend steep grades is produced by means of magnetic attraction, the powers of which can be so exerted that the traction of the two and a half ton motor can be made equal to that of a heavy locomotive. The cost of the "plant" for the most broken country would be about \$5000 per mile, and, as it is of a two and one half foot gauge, the inventor says it can be stored away quite easily. Mr. Edison was led to the discovery by the question of carting tailings from many sections of the placer diggings in California to the place where his sheds will be located. Of the experiment very little can be said. The engine was brought on the track after great difficulty, and everything being ready the circuit was made. As the motor began to move nearly every one of the workmen got on it and away they went slowly. When the down grade was reached the track was found to be very dirty, being covered in some places by sand. The man who had charge of the friction gearing pressed on the lever too hard, and the large cast-iron wheel burst in four sections, stopping any further movement of the motor. The power of the electric current must have been very great, as the reporter saw when the electric spark burned everything in the shape of rust or dirt off the track. It was quite evident that the crowding of the men on the motor caused the accident and put an end to a very interesting experiment.

#### ELECTRIC LIGHTS ON BUOYS.

A gentleman who is engaged in the manufacture of buoys for the government called on Edison a short time ago and gave him an idea of the "whistling buoy", now in use. He said the buoys weigh about 15 tons and that their plunging, even during calm weather generates nearly 3 horse-power. Edison took the hint and had a small dynamo machine made for the purpose of putting it into the buoy and utilizing the 3 horse-power of energy. He was guaranteed that he will give a light jet light for 2 years, and if necessary will increase the light. As the buoys are to be placed along the Atlantic Coast they will, if successful, be valuable in many ways.

Scientific American, June 6, 1880.

#### EDISON'S NEW ELECTRICAL RAILWAY.

But for the chronic aptitude of this generation never to wonder at anything, we might expect to witness expressions of surprise as it becomes known that we are to be whisked through the country at the rate of thirty, forty or fifty miles an hour by an agent invisible and unknown save by its effects; but the moment electricity is suggested as a motive power for railways, the never-to-be-surprised public say "Why not?" Nevertheless the practical application of the electric current to this purpose seems never to have had a prospect of success before the experiments of Dr. Siemens, in Berlin, in 1879, and the present extended experiments of Mr. Edison. It is a subject fraught with difficulties, and while it has always offered a seemingly promising field for inventors, the expense attending experiments of this class has been a most effectual barrier to progress.

Mr. Edison, more fortunate in this respect than many of our experimenters, has not been hampered by monetary difficulties, and having had ample means for carrying out his ideas in practice, he has been enabled to develop his inventions more rapidly perhaps than any other man living.

His new electric railway at Menlo Park is built over natural ground, with little or no grading, and with no regard for curves or grades. It is at present something over half a mile long, and is soon to be extended to form a mile circle. The present rolling stock consists of one electric locomotive and one open car. The general appearance of the railway and its equipments will be seen in our engraving. The motor is precisely like one of Mr. Edison's electrical generators, figured and described in our columns sometime since, and the motive power is supplied by his stationary engine, the power being converted into electrical energy by a single generator.

The current thus created is conveyed to the track by two copper wires, one wire being connected with each rail. The armature of the locomotive makes four revolutions to one of the drive wheels. The machine is managed about like a steam locomotive, and it pushes ahead with wonderful energy.

By invitation of Mr. Edison, representatives of this journal were present at a recent trial of this novel motor, and had the pleasure of riding, with some twelve or fourteen other passengers, at a break-neck rate up and down the grades, around sharp curves, over humps and bumps, at the rate of 25 to 30 miles an hour. Our experiences ~~xxxxxx~~ were sufficient to enable us to see the desirableness of a little smoother road, and to convince us that there was no lack of power in the machine. Mr. Edison says that he realizes in the locomotive 70 per cent. of the power applied to the generator. He will soon add four more cars, and apply improvements which he has in contemplation.

This grand experiment is designed to test the applica-

bility of the electric current to this purpose, and to develop a railway system suitable for plantations, large farms, and for mining districts, and perhaps it is not entirely visionary to expect that our streets and elevated railways may at no very distant day be successfully operated by electricity.

When the motor is complete and the road thoroughly equipped, we hope to be able to present our readers with further details.



New York Herald, July 23rd, 1860.  
(Astor Library)

Electric Locomotion  
Why not apply it to New York's  
Elevated Railroads.  
A fresh air trip at Manlo Park  
Advantages for the Public- Economy  
for the stockholders.

(This article 1 1/2 columns in length)

#### EXTRACTS.

"Edison's belief was that he had found a motor which could ascend or descend any grade short of the perpendicular, which could be operated with ease and certainty and be always under perfect control. What wonderful devices he had for gripping the track and so on were briefly explained."

"What do you have so many curves for"

"Edison laughed as he answered "For the skeptics; you couldn't convince them that she could turn a curve unless they saw her going round one, I am skeptical myself, I had to be convinced before anybody else."

Edison made explanations of his electric brake, which he had not had time to apply to the locomotive yet and more explanations about the way in which he would get over grades that would frighten an ordinary railroader.

"Off we went at about thirty miles an hour, and in a couple of minutes we had travelled the half mile and return. Edison was asked to make certain calculations; the writer undertook to collect some facts, and a meeting for a further talk was agreed upon.

#### IT CAN BE ADOPTED.

The questions are

First.--Admitting the desirability of a locomotive with no smoke, gas or steam and so much less noisy, can Edison's Electric Engine be applied to the Elevated Railways of New York?

Edison's answer was:--The elevated railroads present the best possible conditions for its use, an almost level roadbed and perfect insulation; minimum of cost in application

Second.--Can it be applied and used economically?

Edison's answer was Over \$500,000 a year can be saved to the Company by its use.

These strong statements were worth examination for details. Mr. Edison was asked to sketch the manner in which the electric engine could be applied to the elevated road; said he

#### HOW IT CAN BE OPERATED.

"To operate the four roads through the entire length of Manhattan Island, would need about six electric stations. These need not

be anywhere near the lines, so that they could be selected with a view to low rent and water facilities- I mean driven wells. Each station would furnish its quota of power to the four lines making it greater or less according to the traffic. It would not need a copper wire thicker than three quarters of an inch to convey sufficient power to the tracks. Place the electric locomotive on the tracks give all the cars instead of a portion of them as at present "paper model" covers to their wheels and the thing is done. The wire connections over frogs and switches would not take a couple of men more than a couple of days to perfect."

"Could you utilize the present engines?"

"No. They could be sold. Electric locomotives could be furnished at the very least for what the present engines would bring if sold-steam engines for electric engines. Furthermore as to the manner of applying it, the electric motors could be gradually substituted for the steam motors."

"But the cost of making?"

Mr. Edison.--I will give you a sum to work out. The steam locomotive burns anthracite coal at \$4.20 per ton, the stationary engines would burn dust coal from \$1.50 to \$1.75 per ton. It requires ten pounds of anthracite coal as burned in the locomotive to get one horse power per hour. We can get with the new Babcock and Wilcox furnace one horse power from 2 1/2 lbs of coal or 1 horse power of electricity from 3 1/4 lbs of coal, so much on coal alone; but handling the coal would cost much less because it would not have to be hoisted to the trucks."

"Would there be a saving in labor?"

Mr. Edison.--"I'll give you another sum. They employ an engineer and fireman on each locomotive. One man is all I use on the electric locomotive. It would not need the same skilled labor, for there is utter simplicity in everything about it and I have no doubt men of a higher order of intelligence could be had for the wages paid to firemen else, strike off the engineers altogether, giving in their place twelve engineers and twelve firemen for the six stations. These sums worked out upon thoroughly reliable information give the following figures:-

"There are 160 engines in use on the elevated railroads, they work from 12 to 13 hours each; they are about 30 horse power each; 4800 horse power is therefore required for 13 hours daily. This for the electric stationary engines, according to Mr. Edison's figures would consume 109 tons daily or 3780 tons monthly at 1.75 per ton, \$5722. The twelve station engineers at \$5. per day, would cost \$1080 monthly; the twelve station firemen at \$2.25, would cost \$810 monthly. The wages of 230 electrical engineers would be 15,000.

These sums would yield the following comparisons:-

Elevated Road one month the year for motive power--	
Coal-----	\$35,843
Engineers-----	25,734
Firemen-----	15,025
Total-----	\$76,602

Electric system one month	
Coal-----	\$ 5,722
Engineers & firemen at station-----	1,890
Electric engineers-----	15,000
Total-----	\$22,612

Saving per month by the Electric system----	\$53,990
Saving per annum-----	647,880

From these simple but frequent calculations the reader may be invited to return to the interview for a few additional statements of Mr. Edison.

The electric engines will cost \$3,000 each; the cost of the present locomotives is \$7000 each. I would add this that on account of the simplicity of parts, fewer repairs would be needed. The materials of an electric engine past its service, if broken up, would fetch 1/3 its cost price because its solid iron core and copper wire form the greater part of it. Another thing, and a very important too, is that the weight of the electric locomotive being less than half that of the steam locomotive, and the power being applied continuously, not by reciprocation, it sways the structure less, causes less wear and tear in the same and lessens the noise. No water, smoke, cinders, oil and so on can annoy passengers on the train or streets. There is no danger of fire. The use of electric brakes as powerful as the air brake insures the same degree of safety. Open cars can be used in summer. The current strength from the stations can be regulated so that no train can ever go beyond a certain rate of speed."

When, Mr. Edison, can you exhibit all these points in practical operation on a larger scale?

Mr. Edison:—"In about ten weeks I shall operate eight miles of line on the Camden and Amboy road; the engines now building for me cannot be ready before then."

"Why don't you try it on the New York elevated roads?"

Mr. Edison (smiling):—"I have not been asked."

Why is he not asked? If he can save so much money to the Company it should scent out the opportunity to add to its dividends. The question however is put because more than the stockholders have an interest in such a way of escape from the undeniable nuisances that arise under the present system.

New York Herald, July 24, 1880.

THE ELECTRIC MOTOR.

Edison's Invention Finds Favor Among "L" Road Officials.

TO BE PRACTICALLY TESTED.

The Engine Certain To Be Adopted Should it Meet All Requirements.

The description of Edison's electric locomotive, as published in the Herald of yesterday, caused universal comment among all classes of citizens, but it was particularly interesting reading to the managers of the "L" roads. The possibilities of the future, as pictured in the article, when the engines dashing through the streets shall be noiseless, dustless and smokeless, are most pleasing to the average New Yorker whose head has ached with noise, whose eyes have been filled with dust, or whose clothes have been ruined by oil. The picture was a pleasing one, too, to the executive officers of the "L" road, who have had to stand between a justly indignant public and stock dickering boards of directors. Edison's statement in plain figures that the use of his electric engine would cause a direct saving of over \$500,000 a year was perhaps the most pleasing portion of the announcement to the directors, who no doubt began to consider how they could overcome this last and crushing argument in favor of cheaper fares. But notwithstanding this general feeling of satisfaction it was observable that the members of the Board would say nothing of importance, one way or the other, about the matter. The executive officers had read of the electric motor and had understood it and its importance in connection with such roads as theirs. In the engineers' department the article had been a topic of conversation and comment. There were so many advantages to be gained by the application of some other motive power than steam that anything like Edison's locomotive would be considered a Godsend by the engineers of the "L" roads. The saving in labor, coal and in the original cost of the engines have been summed up in the article, but there was another and a very important factor to be considered. In the first place the locomotives could be made much lighter than those now in use. The present engines are not only heavy, but consume a great deal of coal. The weight makes a considerable wear and tear on the road, and that is a matter of the greatest importance. The stopping and starting, unless performed with the utmost caution, strains the structure more than people have any idea of. Going around curves, too, is hard work, and the wear and tear of the structure is at all times, even with the stringent rules and the most perfect appliances in use, much greater than it ought to be. The substitution of some other motive power for steam would not only be a boon to the public, but to the company as well.

SOME OFFICIAL VIEWS.

Superintendent Onderdonk, of the Western Division, was extremely busy with a number of his subordinates when approached by the writer, but at the mention of Edison's ~~xxxxxxxx~~ electric locomotive his face lightened and he seemed to ~~xxx~~ ~~xxxx~~ regard the possibilities of its use with genuine satisfaction.

"You have read the Herald this morning, of course?" said the reporter.

"Oh, yes," replied Mr. Onderdonk; "I always read the Herald. Must have the news, you know."

"Well, what do you think of the new locomotive?"

"I have not seen it, and so cannot express a very positive opinion about it."

"Yes, but you have read the Herald's description of it?"

"From that it seems like an excellent thing."  
 "And would be a good change for the "L" road?"  
 "Just what we want if it will do what is claimed for it."  
 Passing along the hall the reporter found his way to the  
 office of Director Navaro.  
 "Mr. Navaro," said the reporter, "The Herald published this  
 morning and would like to hear your views on the-----"  
 "I really do not know anything about it," answered the Direc-  
 tor, with a deprecatory wave of the hand.  
 "Edison electric locomotive?" finished the reporter.  
 "I really know nothing of it."  
 "Well, if you found it a success would you put it on the  
 roads?"  
 "I really know nothing of it," reiterated Mr. Navaro.  
 "If it was a success in every way would it not be a good  
 thing for your company?"  
 "Really, you had better see Mr.-----Mr.-----"  
 "Hains?" suggested the writer.  
 "Yes, Mr. Hains. He knows all about these things," and then  
 Mr. Navaro waved himself back into his private office again.

#### AN INTELLIGENT MANAGER.

Colonel Hains, general manager of the Manhattan company,  
 is an exceedingly variation from the average type of the higher "L"  
 road magnates. Although very busy, he welcomed the Herald's represent-  
 ative cordially, and readily consented to give what information he  
 could on the subject.

"You have read the description of the new motor?" the report-  
 er asked.  
 "Yes, I read it in this morning's Herald, and I had been  
 to see it before."  
 "Indeed?"  
 "Yes, I went out to Menlo Park twice to see it. The first  
 time I could not get a very good idea of the motor for various reasons,  
 so I determined to have another look at it. The second time I was  
 accompanied by Mr. Guilford, and we then fully intended to make a  
 test of the motor."  
 "And did you not succeed?"  
 "No, Mr. Edison was very closely engaged with some gentlemen  
 and we could not wait, so we returned to the city."  
 "Well, what do you think of it?"  
 "I do not know what to think of it yet."  
 "Then you will see it again?"  
 "Yes, I intend making a thorough examination of it in every  
 possible way."  
 "When will you do this?"  
 "Mr. Edison told me that he intended to have a 100-horse  
 power engine soon with which to furnish the power."  
 "That, of course, would be a better test."  
 "Yes, much better, as if to show what can be drawn. He is  
 to have also from 8 to 10 miles of railroad track furnished him by  
 the Pennsylvania railroad, so that the experiment can be made properly."  
 "Can much power be applied?"  
 "Mr. Edison says so. He claims that he can draw 30 loaded  
 cars. That is a pretty good train."

#### ITS APPLICABILITY TO THE "L" ROADS.

"What do you think of the system for your roads?"  
 "When it is demonstrated practically that the system can be  
 successfully carried out we will be only too glad to adopt it."  
 "It would be peculiarly applicable to your roads, would it  
 not?"  
 "Unquestionably so. There would be less swaying of the

structure, less wear and tear, no noise and no dirt. It would do away with the demand for so much skilled labor. The locomotive could be operated by less experienced men, and altogether it would be much to our benefit."

"There would be no trouble in applying it?"

"None that I can see. We could have six or eight electric stations and but then these are matters of detail, and the system must be thoroughly and practically demonstrated to be good before we can do anything with it."

"No doubt the surface roads will look into it as promptly?"

"No doubt they will. In fact I guess they are at it now. When I was at Menlo Park I met Mr. Frank Thomson, general manager of the Pennsylvania road."

"Then all you want is a thorough practical demonstration of its reliability before putting it into use on your roads?"

"Of course. We should be only too glad to put any system in use that would abolish the cinders, smoke and noise. We have tried a compressed air motor on the 2nd Avenue surface road, and it was found to work very satisfactorily. We have for some time been looking for a substitute for steam, but we must have a thorough test of any system before we adopt it."

"A thorough test means a practical test no doubt."

"Yes, a practical test in every sense if the word. Many of the inventions do very well for a short time, but when it comes to the wear and tear they are failures. We are constantly experimenting. For instance, since April we have fitted 13 engines on the East side lines to abate noise and the flying cinders and smoke. They have been successful, I think, and we are applying them as fast as we can. It is not an easy matter to make changes on so many engines as ours when they are in such constant use."

#### JUST THE THING.

Mr. R. Stewart, superintendent of the Eastern division, was also up to his eyes in business, but nevertheless had found time to read the article.

"Every railroad man in America is interested in it," he said in reply to a question.

"Have you looked into it closely?"

"No; but I will. Of course I can form no opinion without having seen it."

"It would do nicely for your roads, would it not?"

"Just the thing for us if it is all right. It must have, however, a thorough and practical demonstration."

"It would save much?"

"Save 50% easily."

"And it looks well, does it not?"

"It certainly does look well; but, as I said before, an opinion worth anything cannot be expressed by a man who has not made a thorough examination of it. It all depends on its practicability."

New York Graphic, July 27, 1880.

Page 191 contains illustrations of a trip on Mr. Edison's electric railroad, at Menlo Park, with a view of his locomotive and car. Mr. Edison thinks he has found a motor, which, when perfected, will be of much practical use. The vehicles are so well shown in our pictures as to need but little description. The electricity that supplies the motive power is generated in the engine house hard by, and is sent along the tracks. A line of rails laid at the three feet six-inch gauge stretches away for three or four hundred yards, disappearing round a sharp curve to the left. There is an ordinary truck, with a couple of heavy iron-backed park seats upon it, shaded with a canvas awning supported by iron stanchions. The visitor steps upon the improvised open car and takes his seat, Edison being nearest the locomotive in front. Outwardly this <sup>is</sup> a rude concern, having rough pine boards, painted dark red, for a partial casing, and seats for two. It runs upon four wheels, through which the electric current that is sent along the tracks reaches the electric motor that in turn gives motion to the wheels. This motor is very similar to the electric generators so often described in the newspaper articles on the electric light. The power so curiously generated is communicated to the wheels by leather bands. The brakes are common wooden levers operated by main strength. Briefly, it is an electric machine on wheels, taking up little space and the only thing that reminds one of the ordinary locomotive was a bell kept ringing by tugging at the string.

Our fac-simile of a sketch by Mr. Edison himself of a 100 horse power locomotive to run between Perth Amboy and Rahway will interest our readers as a work of art as well as a promise of a great mechanical triumph.

New York Herald, August 5, 1880.

ELECTRIC LOCOMOTION.

\* \* \* \* \*

PRIORITY OF CLAIM.

As patent lawyers are the most ingenious of their profession in pointing out the great results which hang upon small facts it is best to leave them for the present any quarrel over the priority of claim between the two American inventors. It is stated that Mr. Edison has not yet secured a patent for his electric engine while Mr. ~~Edison~~ Field's was issued on the 13th of last month, the specifications and drawings (without a model) having been filed in the regular application form on the 9th of June. For the present it is only necessary to state that Mr. Edison's electric engine was put on the track at Menlo Park on the 14th of May last. Upon the first trial on the same day a wheel burst, putting an end to the experiment; but on the 28th of May a Herald reporter rode twice over the line of road with Edison, proving the success of the new motor. This antedates Mr. Field's application for a patent by 11 days, but the caveat referred to above of course antedates Edison's first efforts.

HOW IT IS LIKE EDISON'S.

Having seen Edison's engine in operation, and with the drawings and specifications of Mr. Field's electro motor in hand, it can be observed at a glance that there is a great similarity between the two, with, however, such point of difference that one cannot by any possibility be mistaken for the other. Each uses stationary generators for furnishing electricity to the line. The manner of applying the force furnished by an ordinary electric motor, to the wheels is very similar, although there is naturally some difference in the details; but in the method of conducting the supply of electricity to the motor the difference is striking. Mr. Edison's electricity is conducted to the engine from the track itself through the wheels by an ingenious contrivance, while Mr. Field uses another appliance, which shall be hereafter described, leaving it, however, optional with himself to use one or both tracks as part of the conducting apparatus. \* \* \*

TO BE TRIED ON THE ELEVATED ROADS.

What is to be especially rejoiced at by the citizens of New York in this prolific growth of electric motors is the promise it bears of some form or another of them being applied to the elevated roads of this city. Mr. Field's invention, it is stated, will shortly be tested upon them, and if successful or the best attainable, will be adopted. Mr. Field's plan claims that to a certain extent cars or trains can be kept at a certain distance from each other automatically, but this, although plausible, remains to be proved. It would necessitate very short lengths of track controllable by each stationary generator. Success to the electric motors!



New York Herald, August 6, 1880.

# FIELD'S ELECTRO-MOTOR.

A Talk With Mr. Stephen Dudley Field Upon His Patented Invention---Improvements Made and Objections Combated.

\* \* \* \* \*

NO MODEL MADE YET.

"Have you applied your scheme of electric locomotion in any way."

"Mr. Field--I have made no model of my electro motor, and the first one I do make will be a full sized engine to draw a train of cars for trial on the elevated road. I have at present some business on hand for the Western Union--changing the system of electric supply for their telegraph lines from galvanic cells to dynamo machines. It works well and saves money. It is in full operation in San Francisco. You began your experiments in electro locomotion out there I believe?"

"Mr. Field--Yes; I fitted a dynamo machine to an elevator and ran it up and down to illustrate the principal.

## HIS TELEGRAPHIC IMPULSE.

"You have long pursued the study of electricity?"

"Mr. Field--Yes, and kept poor at it. I was out on the Pacific coast for seventeen years. The Herald was right in saying that my Uncle Cyrus and the Atlantic cable were responsible for my turning electrician. I was only twelve years old in 1858, when, after the first Atlantic cable, my uncle came to Stockbridge, Massachusetts, my home. For his convenience a telegraph office was made in a room in my father's house, and the very first day it was put in there I began to learn telegraphing. I was on the Collins telegraph expedition to Behring Strait, and you should have seen me when I got back.

## CRITICISM.

"What is the difference between your machine and Mr. Edison's?"

"Mr. Field--Edison's engine is very similar to Dr. Siemens's, which was exhibited in Berlin a year ago, except that ~~xxxxxxkxxx~~ Edison uses the track solely as conductors. Dr. Siemens, however, has described accurately how it can be done in that way; in fact, just as Edison now does it.

"What objection is there to Edison's method?"

"Mr. Field--It necessitates a wheel that is not solid, and will not, I believe, stand the application of high power and heavy work, though it may do very well for a small engine like he has described as having at present. Why, an express train, going 60 miles an hour, exerts 1000 horse power, and that cannot be done, I think, with ~~paperxx~~ paper mache cores. Another thing is that the tracks are not continuously jointed and a break would be fatal.

"Can you describe now any of the improvements you referred to in your engine?"

## A FLY WHEEL.

"Mr. Field--Well, there is my electric brake, but that is a simple matter. A more important one, however, that I may speak about is the means I have adopted for storing power when the train is at a standstill. A heavy flywheel continues in motion all the time from the momentum it has gained, although the connection with the conductor has been for the moment cut off. When the train is ready to start the accumulated power will be added to that from the electric current."

and send the train off at full speed at once. This will allow me to use much smaller engines relatively.

TO WORK.

"When do you expect to set about preparing your engines?"  
Mr. Field--In about two weeks I shall set about the drawings and then it will not take very long to manufacture the parts and put them together. I shall make a large dynamo machine that will astonish a good many people.

"What dynamo machine do you prefer?"

Mr. Field--Dr. Siemens'. It gives the best results. Edison's is nearly the same.

After some general talk on electrical matters the interview ended. Whoever gives cinderless, smokeless, oilless, waterless, gasless engines to the New York elevated roads will be blessed as well as rewarded, but it is no harm to remind the inventors that he gives twice who gives quickly.

New York Times, August 9, 1880.

An Inventor's Workshop.

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The number of Edison's inventions now in operation, and with an exception or two, paying him an income, is not so large as would be inferred from running over his records of experiment, composing several ponderous volumes. There are among them the American District Telegraph, the electric pen, the repeater telegraph, the duplex telegraph, quadruplex telegraph, stock quotation register, automatic telegraph system, telephone, electro-motograph, phonograph, tasimeter, magnetic repeater, electric light, and electric railroad--the latter in the mining regions of the West, being adapted to grades that cannot be climbed by steam, besides costing for road bed in a hilly country not more than half what a steam railway costs, and for equipments hardly one fourth the sum.

Edison talks enthusiastically of the time when electrical engines will be employed on the Pennsylvania Railroad, and says he can readily obtain a speed of 50 to 60 miles an hour with less danger of accidents than occurs with steam; for the rails transmit the energy that moves the train, and the instant the engine leaves the track this energy ceases to be in communication with it. The other day, at a speed of 40 miles an hour, and with only a twelve year old boy to run the engine, curves of such short radii that a steam locomotive would inevitably have left the track and broken our necks, were rounded in perfect safety without slackening. The light, open car in which the party rode swayed and oscillated, and came near whisking the passengers off at a tangent into a sand-bank, but the wheels attracted by that mysterious energy by which the whole was moved, adhered firmly to the rail. It must be owned that on the return trip Edison's guests were a little more vigilant when they went round the curves. The source of power in the little engine--also provided with electrical brakes that arrest its motion almost instantaneously--is an electrical bobbin or rather an armature, revolving between the poles of a magnet, in the same manner as in an ordinary generator of the Edison-Siemens pattern. The two tracks transmit the energy to the wheels of the engine, the whole train being thus an armature that connects the extended poles of the powerful generator in the laboratory, and thus establishes a circuit. From the wheels the current flows through the bobbin, which revolves between the poles of a stationary magnet. To stop the train, it is only necessary to take the current through a copper wire, instead of the armature, and this is done by the merest pressure of the finger upon the button. In experiments that have been conducted upon a section of the road having a rising grade of 50 feet to the mile, (about 1 foot in every 100,) this little engine has drawn loads that would severely tax the capacity of a locomotive upon the ordinary grades allowable on railways operated by steam. The Pennsylvania Railroad Company talks of trying electricity as a motor--so Edison says--with freight trains first, and then, if satisfactory, for passenger transit; but this probably lies pretty far in the future. The economy of electricity as a motor, utilizing as many horse power from 300 pounds of coal as steam from 700 is not in question; but whether it would prove as reliable in all sorts of weather is something that only experience can determine.

New York Herald, August 10, 1880.

#### ELECTRIC INVENTIONS.

Mr. Edison Not Troubled About Mr. Field's Patent For An Electric Locomotive--Quiet Criticism--A Practical Test Wanted--The Electric Light.

At Menlo Park the claims put forth on behalf of Mr. Stephen Dudley Field's patent in connection with an electric motor do not awaken any outward signs of apprehension. There was something very jolly in the ring of Mr. Edison's voice as he explained to the writer that it was all wrong to suppose Mr. Field's patent conflicted with his applications.

"It is a curious thing," he said, "How vague the ideas of the general public are on the question of patents. Half, yes more than half, the industry of the country is conducted under patents, but few know anything about their powers or application. There is no trouble and comparatively little delay about getting a patent within certain well understood lines if the alleged invention is only a device for improving or using in a new or particular way some part of a machine already invented or in common use. That is what we call a little thing. But it is about the big things that there is delay. Here is a case in point:--The telephone has been a long while in use, but not a single American patent has been issued yet upon the points that really control all telephones, while there are several for insignificant alleged improvements in telephones. The telephone is a 'big thing', and is in 'interference'--that is to say, conflicting claims are before the Patent Office Authorities, and the process of reaching a decision is necessarily slow."

#### THE CLAIM'S THE THING.

"How does that bear upon Mr. Field's claims?"

"Just this, that Mr. Field's patent gives him a certain device to be used in electric locomotion, and nothing more. We have had it in the office for several days. I referred just now to the confusion in the public mind about patents. People, for instance, are misled by the drawings. A man wants to improve a sewing machine in some little particular. He draws an entire machine with his 'improvement' in it, and people think he has invented it all. Mr. Field has his combination of an electromagnetic motor and its commutator, with a circuit controlling lever capable of three positions, his railway-track rail with a slotted tube containing an insulated conductor and some hot water pipes for his tube. All that is nothing to me. The whole thing is a device for a particular object, and Mr. Field is welcome to it."

"Then you do not consider your engine endangered by anything in his claim?"

"Not in the least. My engine has been running since last May; my applications were duly filed, and we have received no notice of interference. The things are completely different."

MAKE A PRACTICAL TEST.

"What do you think of Mr. Field's device? Is it an improvement on yours?"

"The proper way to settle that is to put his device to practical test. This much I may say, that I think the bar or lever going down from an engine through a slot in a tube to a conductor rather dangerous and likely to prove impracticable. He will know when he builds his engine. The difficulties are great for him, first to secure constant contact, next to work his lever and then to take off his power. He cannot take off more than 20 horse power, and high speed will be impossible."

"Mr. Field has stated that you cannot work your engine at high speed doing heavy work with wheels having papier mache cores."

"Well, we do work with them and will keep on working. That's all right. They have lots of them on his Uncle's road. I am preparing for a test of my engine on that steep grade you have seen back of where we stopped the engine when we took you out the other day. I am also building the engine for drawing freight and passenger cars on a branch of the Pennsylvania road, and then we shall know all about solid wheels and other things. I see, too, that Sawyer has been writing another letter. He says that electric engines will wear out more quickly than steam engines. What nonsense! But Sawyer must always write a letter. He can do that first rate."

To prepare his present electric engine for the work of ascending the steep grade referred to, Mr. Edison is now putting into it the proper machinery to take the place of the temporary bolting he has been using. He is in no way worried about rival claims."

33 West 25<sup>th</sup> St

Apr 29 1880

My dear Hammer,

Is this of use to you?

N. Y. Herald Aug 10<sup>th</sup> 1880. Edison in an interview says:—"I am also building the engine for drawing freight and passenger cars on a branch of the Penn<sup>a</sup> R R and then we shall know all about solid wheels & other things."

Batchelor

New York Herald, August 10, 1880.

MEMO PARK.

Everyone hard at work--Edison's Electric Railroad in Working

Order--Progress of the Gold Hunters.

When the large gearing wheel of Edison's electro motor burst about one week ago he at once set to work and devised another mode of transferring the power (generated by the revolving armature) to the wheels. He had three wooden pulleys made and connected them by belting ~~them~~, the pulleys being so proportioned as to get a good velocity at the turning shaft. He was "cruising" up and down his three-quarter mile railroad on Friday last when notice came that the officers of the Austrian corvette Salda were approaching. He at once began to show them everything worth seeing in and around the laboratory, and, after the visitors were satisfied with examining the novelties he gave them a ride on his new railroad. The distinguished party, or at least some of the principal members of it, took seats on the car that is attached to the motor. A small lever was moved connecting the circuit, and away they went. The speed attained while going round the curves was anything but pleasant to those on the cars, but, although the road is new and is very indifferently built, no accident occurred. The party returned by a late train to the city, feeling that they had seen one of the many wonders of the Republic. Mr. Edison proposes to build an additional mile and one half, in which there will be one grade as steep as one foot in every six and three-quarter feet. This will be into a deep gully and up the other side. His intention is to show that a train can be run wherever a horse can draw a wagon.

A Peep into Edison's Laboratory.

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Edison talks enthusiastically of the time when electrical engines will be employed on the Pennsylvania railroad, and says he can readily obtain a speed of 50 to 60 miles an hour with less danger of accident than occurs with steam; for the rails transmit the energy that moves the train, and the instant the engine leaves the track this energy ceases to be in communication with it. The other day, at a speed of 40 miles an hour, and with only a twelve year old boy to run the engine, curves of such short radii that a steam locomotive would have inevitably left the track and broken our necks, were rounded in perfect safety without slackening. The light, open car in which the party rode swayed and oscillated, and came near whisking the passengers off at a tangent into a stand-bank, but the wheels attracted by that mysterious energy by which the whole was moved, adhered firmly to the rails. It must be owned that on the return trip Edison's guests were a little more vigilant when they went round the curves. The source of power in the little engine--also provided with electric brakes that arrest its motion almost instantaneously--is an electrical bobbin, or, rather, an armature, revolving between the poles of a magnet, in the same manner as in an ordinary generator, of the Edison-Siemens pattern. The two tracks transmit the energy to the wheels of the engine, the whole train being thus an armature that connects the extended poles of a powerful generator in the laboratory and thus establishes a circuit. From the wheels the current flows through the bobbin, which revolves between the poles of a stationary magnet. To stop the train, it is only necessary to take the current through a copper wire, instead of the armature, and this is done by the merest pressure of the finger upon the button. In experiments that have been conducted upon a section of a road having a rising grade of 50 feet to a mile (about one foot in every hundred) this little engine has drawn loads that would severely tax the capacity of a locomotive upon the ordinary grades allowable upon railways operated by steam. The Pennsylvania railroad company talks of trying electricity as a motor--so Edison says-- with freight trains first, and then, if satisfactory, for passenger transit; but this probably lies very far in the future. The economy of electricity as a motor, utilizing as many horsepower from 300 pounds of coal as steam from 700, is not in question; but whether it would prove as reliable in all sorts of weather is something that only experience can determine.

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Electric Rail-  
Road Letters  
for, 1881

Rails  
Wheels  
Trucks  
R. R.

T. A. EDISON,

Menlo Park, N. J., April 11<sup>th</sup> 1881.

Mr Y A Edison.

Dear Sir  
the work for to day is as follows  
altering commutator for large machine L. H.  
fitting up furnace & blower for Dr. Harts  
machine for soldering wires for L. H.  
altering rubber mould for the L. H.  
small clamp machine for L. H.  
it is finished  
repairing cutting blocks for L. H.  
working on armature with new discs  
winding magnets for five H. P. motor  
with  $4\frac{1}{2}$  1000<sup>th</sup> wire 3 $\frac{1}{4}$  layers  
don't you want one layer of no 10  
wire on the outside of this  
the porter engine has run all day  
it has run no better than it has  
been doing porter has not been here  
yet

yours Respectfully  
Thos Logan

W.H.  
~~W.H.~~ ~~W.H.~~ Park  
Factory  
Apr 11  
Phos Hogan  
work for  
the day

Note.

Refers to minding  
8 1/4 layers of 49  
on front & sides  
if he discovers one  
layer of #10 mms  
on outside of them

H. J. Hammer

10

SPECIFICATION

OF AN

EIGHT-WHEELED

"Forney" Locomotive Engine,

FOR THE

MANHATTAN RAILWAY CO.

GAUGE—4 feet  $8\frac{1}{2}$  inches.

CYLINDER—11 in. diameter, 16 in. stroke.

DRIVING WHEELS—42 in. outside diameter.

TRUCK—4-wheeled.

TENDER—none.

BOILER—Steel.

FURNACE—Steel.

FLUES—Iron.

FUEL—Hard Coal.

TANK—800 gallons.

# SPECIFICATION OF AN EIGHT-WHEELED "FORNEY" LOCOMOTIVE ENGINE,

Having Four Coupled Wheels and a Four-Wheeled Rear Truck,

FOR THE  
MANHATTAN RAILWAY CO.

## GENERAL DESCRIPTION.

CYLINDERS—11 in. diameter and 16 in. stroke.	DRIVING WHEEL BASE—5 feet.
DRIVING WHEELS—42 in. diam. over tires.	WEIGHT—in working order, Total about 33,000 pounds.
GAUGE—4 feet 8½ inches.	GENERAL DESIGN—Engine No. 281.
FUEL—Hard Coal.	
TOTAL WHEEL BASE—about 16 ft. 3 in.	

**BOILER.**—Material—Made throughout of best Otis steel plates,  $\frac{1}{8}$  inch thick, riveted with  $\frac{1}{2}$ -inch rivets, placed not over two and one-quarter inches from center to center, all horizontal seams and junction of waist and furnace to be double riveted. All parts well and thoroughly stayed, and extra welt pieces riveted to inside of side sheets, providing double thickness of metal for struts of expansion braces. All plates planed at edges and caulked with round-pointed caulking tool, insuring plates against injury by chipping and caulking with sharp-edged tools. Boiler to be tested with hot water to 180 pounds pressure per square inch.

**Waist.**—Forty inches in diameter at smoke-box end, made straight and with one dome twenty inches diameter and twenty inches high, placed centrally on boiler. Smoke-box door to be ribbed inside. Door to be held with clamps. Number plates to be held to smoke-box door with a fixed stud. Dome cap to have cast iron collar to avoid dripping of water from safety valves. Steam pipes of cast iron.

**Tubes.**—Of lap-welded charcoal iron, with copper ferrules on fire-box ends. 130 in number,  $1\frac{1}{2}$  inch diameter and 83 inches in length.


**Fire-box.**—42½ inches long, 34½ inches wide inside, of Otis best steel plates, all plates thoroughly annealed after flanging. Side, back and crown sheets five-sixteenths thick, fire sheet one-half inch thick. Water spaces, sides, back and front, 2½ inches wide. Stay-bolts  $\frac{3}{4}$  inch diameter, 4½ inches from center to center. Fire door opening formed by flanging and riveting together the inner and outer sheets. Crown sheet formed circular and stayed to roof sheet by radial stay-bolts  $\frac{3}{4}$  inch diameter, 4½ inches between centers, screwed through the crown and roof sheet, and riveted over.

**Cleaning Holes.**—Cleaning plugs in corners, sides, front and back (2 inches diameter), also cleaning plugs front under waist;  $1\frac{1}{2}$  inch blow-off cock in front of fire-box.

**Grate Bars.**—Water tubes  $1\frac{1}{2}$  inch in diameter, about 10 in number, with two drop bars.

**Ash Pan.**—Ten inches deep, No. 6 iron, with a damper on each side, and a row of  $1\frac{1}{2}$  inch holes on each side; to be water tight. Dampers to be tightly fitted.

**Smoke Stack.**—Straight, of cast iron, 11 inches inside diameter at bottom, 12 inches inside diameter at top. Design as per drawing to be furnished by the Manhattan Railway Co. Bell cord loop on left side six inches below top.

**Drip Pan**—Under the entire engine, except furnace,  $1\frac{1}{2}$  inch angle-iron around top, and to have two drain plugs, section thus  To be suspended with hinges from the furnace. Drip pipes from the cylinder saddle to lead off condensation.

**Throttle Valve**—Balanced puppet throttle valve of cast iron, not less than nine square inches area, in vertical arm of drip pipe. Throttle valve sleeve and stuffing box to be extended inside of cab.

**Frames** (of best hammered iron in two sections)—Main frames forged solid, front rails bolted and keyed to main frames, and with front and back lugs forged on for cylinder connections. Pedestals projected from rear of boxes by cast iron gibs and wedges. Pedestal caps lugged and bolted to bottom of pedestals.

**Truck**—Center bearing four-wheeled with swing bolster. Truck frame and pedestals of wrought iron, with adjustable die for center-pin bearing.

**Wheels**—Four Allen paper wheels with "Standard" steel tire, 26 inches diameter, to Manhattan Railway Co's standard.

**Axles**—Of best Otis steel with outside journals.

**Springs**—Of best cast steel, manufactured by French & Co., Pittsburgh, Pa.

**Cylinders**—Of best close-grained iron, as hard as can be worked; right and left hand cylinders reversible and interchangeable, accurately planed, fitted and bolted together in the best manner. Steam passages in cylinders and saddles to have not less than eight square inches area, and exhaust passages to be not less than ten square inches area; valve face and steam chest raised above face of cylinder to allow for wear. Cylinders to be oiled by oil valves placed in cab and connected to steam chests by brass pipes running under jacket. Pipes proved to two hundred pounds pressure. Cylinder cocks to have separate pipes to drip pan and worked from cab by a lever. Steam chest joints to be grooved for copper wire gaskets.

**Exhaust**—Noiseless, according to plans furnished by Manhattan Railway Company.

**Piston**—Cast iron, without follower; packing rings known as Ramsbottom system, of cast iron, sprung into grooves. Piston rods of Otis steel,  $1\frac{1}{2}$  inch diameter, accurately fitted to piston, secured to piston by a nut and to cross-head by a key.

**Guide Bars**—Of wrought iron, case hardened, 3 inches by 3 inches, fitted to wrought iron guide-yoke  $\frac{3}{4}$  inch thick, safety strap forged on yoke, secured by  $\frac{3}{4}$  inch bolt at each end.

**Crossheads**—Of wrought iron with cast iron gibs 14 inches long, babitted.

**Valve Motion**—Most approved shifting-link motion, graduated to cut off equally at all points of the stroke. Links, sliding blocks, pins, lifting links, and eccentric rod jaws made of best hammered iron, case hardened. Sliding blocks with long flanges to give increased wearing surface. Rock shaft of steel and reverse shaft of wrought iron. Valve stems 1 inch in diameter.

**Driving Wheels**—Four in number, 42 inches diameter. Centers of cast iron, with hollow spokes and rims, counter-balanced with lead and turned to 35 inches diameter to receive tires. Same pattern as Engine 281. Wrist pins, of Otis steel.

**Tires**—Of best cast steel, made by Standard Steel Works; 2 inches thick when finished; both tires flanged,  $5\frac{1}{2}$  inches wide.

**Axles**—Of best Otis steel. Journals  $4\frac{1}{2}$  inches diameter,  $6\frac{1}{2}$  inches long. Driving boxes of cast iron, brass bearings, babitted, forced in by hydraulic pressure.

**Springs**—To be of French & Co's manufacture. Equalizing beams of wrought iron and of most approved arrangement, with steel gibs and keys.

**Rods**—Connecting and parallel rods of best Otis steel forged solid, furnished with all necessary straps, keys and linings. Oil cups, Nathan & Dreyfus pattern.

**Feed Water**—To be supplied with two No. 4 Friedman Injectors.

**Foot Plates**—Of cast iron with corrugated surface. To be flanged over the frames and well secured thereto. Running boards of sheet iron stiffened with angle iron.

**Cab**—Cab of same design and finish as Engine 281. Cab roof gutters to have outlets on both sides. Doors to be made to slide. Cab handles wrought iron.

**Finish**—Same as Engine 281. Cylinders lagged with wood and neatly eased with iron and painted; head covers of cast iron, polished; steam chests, with cast iron tops or covers polished on edge; bodles eased with iron, painted. Dome lagged with wood, jacketed with iron, painted, cast iron top and bottom rings. Boiler lagged with wood, neatly jacketed with Wood's Russia iron, and secured by plain Russia bands. Back cylinder cover to be made in two parts, neatly joined with wrought iron straps and cap screws.

**Furniture**—Engine to be furnished with two sand boxes, so as to sand in both directions. Rods connected with levers on foot-board. Brackets to hold signal lamps at both ends. Signal going to ring in either direction. Whistle, 2 inches diameter,  $2\frac{1}{2}$  inches long, with step-cock between it and connection to dome. Two safety valves with Shaw's muffler attached, Crosby's Patent American Steam gauge. Six-inch cab lamp. Three gauge cocks, with drip pan. Oil can and tallow pot. Also, a complete set of tools, consisting of one pinch bar, a complete set of wrenches to fit all bolts and nuts on engine. One large and one small monkey wrench, one hard hammer, one soft hammer, two chisels, tool boxes, cab seat, poker, scraper, clinker hook and slicer bar. Tender brake diaphragm to be secured to the frames or the back end of furnace, and set to both.

**Painting**—Engine to be handsomely painted and varnished, and ornamented same as Engine 281.

**Construction**—All principal parts of engine accurately fitted to gauges and templates, and thoroughly interchangeable. All finished movable nuts and all wearing surfaces of machinery made of steel or iron case-hardened. All wearing brasses made of ingot copper and tin alloyed in the proportion of seven parts of the former to one of the latter. All threads on bolts to be United States standard.

**Tank**—Strongly put together with angle iron corners and well braced. Top and bottom plates of No. 6 iron. Side plates of No. 8 iron, riveted with  $\frac{5}{8}$  inch rivets, one and one-quarter inch pitch. Water capacity 600 gallons. Reservoir under tank where feed-pipe attaches. Coal bunker, capacity about 1,000 pounds, same as Engine 281. Manhole in tank to have a five-inch collar with wrought iron cover. Coal box bottom to be covered with  $\frac{3}{4}$  inch wrought iron neatly fitted.

**Tool Boxes**—One tool box, of iron, placed back of tank.

**Brakes**—Eames' Vacuum, the latest improved. Ejector in cab. Muffler attached to ejector manufactured by Thos. Shaw, Phila.

**Draw Bars**—To be made of wrought iron, of skeleton pattern, to same length, height and fits as present bars. Steadying spring to be placed on top side.

**Hooks**—One hook on each end for Vacuum Brake Hose.  
" " " " Heater Hose.

---

General Manager.

*C. M. W.*  
PRESIDENT'S OFFICE.

MANHATTAN RAILWAY COMPANY,

No. 71 Broadway,

New York *April 21, 1887.*

Thomas A. Edison, Esq.  
65 Fifth Ave.  
New York,

Dear Sir:

Yours of the 19<sup>th</sup> inst. to hand, & which have been answered sooner, but for my absence from the City.

We have no tracing of our Standard Engines, but I enclose you herewith, a specification. If you will call at our office at any time, I will show you a photograph of the same.

Yours Truly,  
*R. M. McQuay*  
President.



Form No. 200.

**THE WESTERN UNION TELEGRAPH COMPANY.**

INCORPORATED  
21,000 OFFICES IN AMERICA. CABLE SERVICE TO ALL THE WORLD.

THOS. T. ECKERT, President and General Manager.

Receiver's No.

Time Filed

Cheek

**SEND** the following message subject to the terms  
on back hereof, which are hereby agreed to.

189

To

Agreement bet. H. Villard &  
Thomas A. Edison, dated N.Y. Sept. 14, 1898,  
taken out  
for use in East  
Siemens-Halske El. Co. of Am.  
as Met. West Side El. Co. et al.  
Sept. 12, 1898.

☒ READ THE NOTICE AND AGREEMENT ON BACK. **BT**

ALBERT BRIDGES,

Manufacturer and Dealer in

Railway, Steam and Gas-Fitters' Supplies,

No. 46 Cortlandt Street,

P. O. Box 2843.

New York, Sept 20 1881

Mr. Chas. S. Hughes.

Dr Sir

Mass King & Co. Right  
I send you the enclosed letter  
at my suggestion

Yours Respectfully

Albert Bridges.

Form No. 280.

**THE WESTERN UNION TELEGRAPH COMPANY.**

INCORPORATED  
21,000 OFFICES IN AMERICA. CABLE SERVICE TO ALL THE WORLD.

THOS. T. ECKERT, President and General Manager.

Receiver's No.	Time Filled	Check
----------------	-------------	-------

**SEND** the following message subject to the terms  
on back hereof, which are hereby agreed to.

189

To Letter to J. A. E. from C. Goddard Ray  
dated Sept. 28. 1891 giving authority to  
make contract with Valand taken out for  
me in suit Siemens-Halske El. Co. of Am.  
as Met. West Ind. El. Co. et al

Sept. 12. 1898

READ THE NOTICE AND AGREEMENT ON BACK.

New York, September 28, 1881

Thos<sup>s</sup> A. Edison Esq<sup>t</sup>

Dear Sir

At a meeting of the  
Executive and Finance Committee held on the 23<sup>d</sup>  
inst. the following statement was made by the  
Vice-President

"Edison will build 2½ miles of Electric  
"Railway at Menlo Park, equipped with 3 Cars.  
"2 Locomotives, one for freight, and one for pass  
"enger, capacity of the latter 60 miles per hour.  
"Capacity freight engine 10 tons net freight, cost  
"of handling a ton of freight per mile per horse  
"power to be less than with ordinary locomotives  
"Experiments in traction and economy  
"and practicability to be made by Edison and  
"supervised by Villards engineer, if experiments  
"successful, Villards to pay actual outlay in Exp  
"eriments and to treat with the Light Co. for  
"the installation of at least 50 miles of Electric R.R.

W. D. L. L. No. 101. Mr. D. L.

Aliment-Valley Co. of Am.

Met. West side Elav. Co. and

"Expenditures" Exhibit Edison Electric Light Co. Sept. 27, 1881.

Oct 12, 1881.

2

" in the wheat regions.

" It is also assumed that the cost of the track  
" will not exceed \$2300 per mile, that of the  
" locomotives and cars \$800 and \$250 respect  
" ively each, and the experiments not exceeding  
" \$500, unless Villard's engineers should require  
" further Experiment

" It is understood that Villard shall own the  
" whole of the Electric Railroad, including mot  
" ives in power and rolling stock, if he pays for the  
" same under this agreement "

H. Villard  
Thomas A Edison

New York Letter 14, 1881

The following resolution  
was then adopted, of which I was instructed  
to furnish you a Copy.

" Resolved. That this  
" Company will make no objection to the

3

" carrying out by Mr Edison on his own account  
" personally and without any liability whatever  
" to this company of the foregoing personal arrang-  
" = ement between him and Mr Villard, it being  
" however distinctly understood, that the expenses  
" for such railway shall, in no event, be charged  
" either in whole or in part to this company, and  
" that no concessions, licenses or privileges of any  
" description, touching the patents of the company,  
" are intended to be given by this resolution; it  
" simply being the intention of this resolution to  
" allow Mr Edison to proceed on his own personal  
" risk to carry out his said memorandum  
" with Mr Villard "

Yours truly

C. Goddard Tracy

LOCOMOTIVES,  
RAIL ROAD CARS,  
CAR WHEELS,  
" AXLES,  
" IRON,  
IRON RAILS,  
STEEL "  
CAR SPRINGS,  
RAILWAY SUPPLIES,  
MACHINERY  
of every description.

BROKERS IN  
OLD RAILS,  
SCRAP IRON,  
PIG  
METAL, ETC.

KING & MCTIGHE,

COMMISSION DEALERS

— IN —

RAILWAY EQUIPMENT AND SECURITIES.

NO 46 CORTLANDT STREET.

New York Sept 20 1881

Mr. Chas. F. Hughes  
Manito Park. N.J.  
Dear Sir

We have <sup>had</sup> referred to us, your  
enquiry of "Allier's Bridges", for 75 tons of 16 lb Gross  
T. Rails - in reply to which, we will be pleased  
to quote you \$53<sup>50</sup> per Gross tons at mill - if you  
want these Rails del'd in Jersey City, it will cost  
in the neighborhood of \$2<sup>75</sup> per ton, additional  
as freight. This offer is subject to immediate  
acceptance, as we can take them from a lot  
that is now ready to be shipped on our &c

Yours Truly

King & McTighe

Warerooms, 10 Cortlandt Street.



C. H. Delamater Established 1841. D. D. Robinson

**DELAMATER IRON WORKS**  
C. H. DELAMATER & CO. PROPRIETORS.  
**BOILER MAKERS**  
**ENGINE BUILDERS AND FOUNDERS.**  
FOOT OF WEST 137<sup>TH</sup> ST.  
NORTH RIVER.

New York, Sep 21<sup>st</sup> 1881

Chas D Hughes

Office Park St

Dear Sir

We can furnish  
you with 16<sup>th</sup> high pattern  
iron rails at \$60 per ton provided  
you will take 100. Tons

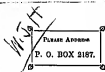
Please answer by return mail  
as we cannot keep the offer  
open.

Very truly Yours

C. H. Delamater  
Amek

Please address ALL business communications to C. H. DELAMATER & CO.





PIERSON & COMPANY,

ESTABLISHED 1700.

Iron and Steel and General Commission Merchants,

24 BROADWAY, AND 77 & 79 NEW STREET,

New York, Sept. 22<sup>d</sup> 1881.

Chas. F. Hughes, Esq.  
Mexico Park  
Chas. F.

Dear Sir. I have solicited your order for  
1 1/2 miles or 38 gross tons 16 to high  
pattern Tee Rails and quote \$52.50 per ton  
f.o.b. I will not cash, freight to New York  
\$3. per ton, and we do not think it would  
be any more to Mexico Park perhaps less,  
we will however if you favor us with  
your order use our best diligence to get  
you the very lowest possible rate freight,  
the Fish Plates Bolts & Nuts would be  
35¢ per complete joint and 3 1/2 x 3/8 Spike  
4 1/4¢ per lb. to could deliver in about two weeks  
Very, Respectfully, Yours

Piereson & Co.

Mr. T. A. Edisaw

Dear Sir, This is the  
lowest bid.  
Yours Truly  
Chas. F. Hughes

IRON & STEEL  
MERCHANTS  
O. BOX 2187  
New York, N.Y.  
22 BROADWAY  
Sept. 27<sup>th</sup> 1881  
You recd. order 26<sup>th</sup> inst. and  
without further delay, we hope to  
get them in time, with pleasure.  
Yours in  
P. Wilson & Co.  
To N. A. Edison Esq.  
Menlo Park N.J.

VANDERBEEK & SONS  
Lumber Yard  
PLANING MILL AND BOX FACTORY  
P. O. BOX 278

Jersey City, N. J., Sept 30, 1881

J. A. Edison Esq  
Munro Park  
Dear Sir

Answering your  
favor of this date, to fill your order  
we were obliged to cut some overlengths  
but none that wasted over a foot  
supposing the blocks might be of use  
to you we sent them —  
We can make the blocks complete  
the order

Very truly  
Yours  
Wm. A. Vanderbeek

Mr T. D. Given. Oct 18<sup>th</sup> 81

Mr Howard Ayers has  
a piece of ice on his  
heart and want let you  
through his property  
to the Kentucky Road  
in the only place that  
is really available  
for less than \$300, and  
would consider it a  
great favor if we were  
to decide not to go  
at all. What shall  
we do.

Yours Truly  
Hughes

Parkway Oct 19 1896  
T A Edison Esq

Dear Sir: I have been  
yours of 18th. I would we do  
not deal in square timber  
we can cut yours for of good  
Sound Material of Length 4 ft  
& up to 4 in as there is nothing  
for of our length it would take  
more logs to cut than than we have  
therefore we should have to vary the  
length a little but our neighbors  
will be sure can take the matter over  
Yours Respectfully  
Luther

161 Geo. Gouraud

New York, Nov. 4th 1881.

65 Fifth Ave.

My Dear Colonel:-

It is some time since I wrote you the reason being that with Mr. Johnson on the spot there was very little that I could tell you from here. I do not think matters have taken any new departure since Johnson left and I merely write this so that you shall not think that I have entirely forgotten my promise to keep you posted as to progress made on this side of the water.

Edison is working very hard indeed and has been for a long time past and he has now the pleasure of seeing all his various shops running with such charming regularity that it almost becomes monotonous. Our capacity for turning out these small dynamos is almost unlimited. We have 400 now under way and when that lot is finished shall probably go ahead with another order of about the same number. Last week we turned out twenty three. This week we shall do about the same. Our Lamp Factory has a stock of 50,000 lamps so that it can keep apace with our output of machines. The main business in hand just now is the laying of street mains for the Central Station work. We do this work entirely at night and as the result of two or three night's attention paid to it by Mr. Edison he has got it systematized so that with quite a small force we can lay one thousand feet a night. I was down to the Central Station to day and saw them putting in the first boilers. These go underneath the dynamos the latter being carried on a structure built very much after the style of the

Elevated Railroad here.

Mr Edison is now having a new track laid for his electric railroad. It will be about three miles long on perfectly level ground and is intended for experimenting on traction, speed and such like matters. He is building a passenger locomotive which will be fitted up in splendid style and which will have a maximum capacity of one hundred miles an hour. Whether it will ever be run at this rate when finished will very much depend upon the courage of the driver. I think it would be a very good speculation to insure the lives of the passengers the first time Mr. Edison determines to run at this speed. Then he is going to build a freight locomotive which will have sufficient power to draw cars each carrying tons of freight. I suppose that the whole thing will be finished in say three months or maybe a little longer. The road bed is all graded so that the permanent way will be completed in a very short time.

You may remember those two bronze medallion portraits of Mr. Edison working on his Phonograph which was got up by Mr. Kelly and which were sent over in a package of Telephones some time in the latter part of '79 or '80 I am not sure which. Mr. Kelly was in here the other day and I promised to see if you could do anything with a number of those. He had to give up the work in order to attend to some other matters but he is now free and could let you have a supply if anything could be done. Cannot you put Mr. Kelly in communication with the London Stereoscopic Co.? Considering the honors which Edison has gained at Paris

and the prominence his name will attain in connection with Johnson's operations in London I should think they could sell a great number of them. Mr. Kelly incidentally informed me that you did not pay for these medallions. I think the cost was to be about ten dollars each. Will you send me a check for that amount so that I can hand it to him? Talking about accounts reminds me that Wilber has several times asked me to jog your memory about his fees on Ore Milling. He sent papers to you and a bill for seventy five dollars but has never received payment. The things were sent to you from Menlo Park. I think I remember them coming about August 1880.

Cannot you write us a long letter, a long one I mean; one of those very long ones something after the style of those you used to be so fond of dictating to me explaining to us the whole situation in England of electric light and kindred matters and a full account of your own impressions and the impressions of English scientists on Mr. Edison's exhibits at Paris. We have had everybody else's opinion except yours and I am sure it would please Mr. Edison very much if you were favor us with your views at very considerable length.



*L. Insull*  
Nov.  
To Command

Nov. 4-81

1. The first step is to identify the problem. This involves understanding the current situation and the goals that need to be achieved.

1. The first step in the process of the formation of the State is the formation of the State. The State is a political organization that is formed by the people of a territory. The State is a political organization that is formed by the people of a territory. The State is a political organization that is formed by the people of a territory.

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the performance of these. The principal functions of the system are to:

1870

[illegible]

*Edison Railway Co. New York, Nov 15 1881*  
*Metro Park Exp.*  
 To **BERGMANN & CO. Dr.**  
 [BY APPOINTMENT.]

MANUFACTURERS OF EDISON'S INVENTIONS,  
 EDISON'S ELECTRIC LIGHT APPLIANCES A SPECIALTY.

108-112 WOOSTER STREET.

<p>798 lb Angle pieces to order          2 lbs of Gas          By Perm R.R. Co.          Chas. Hughes          Metro Park          N.Y.</p> <p><u>Duplicate</u></p>	<p>10</p> <p>79 80          1 50</p>	<p>\$ 81.30</p>
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MANUFACTURERS OF EDISON'S INVENTIONS,  
EDISON'S ELECTRIC LIGHT APPLIANCES A SPECIALTY.

New York, Nov 15 1881

Mr Chas J. Hughes  
Mead Park N.Y.

Dear Sir

Inclosed please find  
invoices for the goods price  
ordered - Balances of which have been  
sent by Am. R.R. today - We have  
sent the bill to you as ordering the  
goods. Please let us know by re-  
turns mail who will pay the bill  
& oblige

Very Respectfully  
Benjamin Co.  
J.H.K.

EDWARD H. JOHNSON,  
MANAGER

THE EDISON ELECTRIC LIGHT SYSTEM.

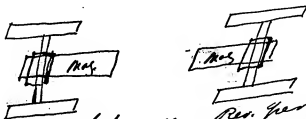
57, Holborn Viaduct.

London, E.C. Nos. 23 1881

My Dr Edison.

Philip Park - Financial man of the  
France Battery Concern - has just been  
in to see me - to have me write  
you immediately to Ascertain if you  
will construct for them, for me at  
Crystal Palace - a Railway Motor  
to be operated by their Batteries -  
His Idea is as follows:

A Truck with 4 wheels



4 ft wheel - 4000 Res. per minute

- Upon which he will put a Platform
- to carry 12 Tons of Batteries
- Wants about 200 Volts E.M.F.
- On top this Platform will put the Car proper -

Says with each Battery Can get 25  
H.P. - for 9 hours - Is immensely  
excited over it - wants you to  
cable, if you will accept order

THE EDISON ELECTRIC LIGHT SYSTEM.

EDWIN H. JOHNSON,  
MANAGER.

57, Holborn Viaduct,

London, E.C. 188

How long - How much, & What if  
any change of Valt, you would  
suggest - Can accommodate your  
wishes in this respect.

What do you say? Would it  
be a good thing to do - in view  
of the very poor thing shown  
by Siemens at Paris? -

Also wants to know if you can  
make little 1/2 H.P. motor - light  
weight for ~~the~~ Tricycles - 2 & 4  
Valt D.M.F. - latter not draft -

If no objection - thinks you could  
make Card out this R.W. 6 1/3:  
& at same time make a little  
profit out his order -  
What say you?

Edw. H. Johnson

Sir Wm accepts offer of Dynamo  
with many thanks - wants compare it  
with special one has just had  
Siemens make to his order - That's  
competition for you - I'll get you  
the facts as to results E.H.J.

Note W.J.H.

Received 6/12/81  
Wm. L. Brown Esq.  
Mendota Park N. J.  
Philadelp<sup>h</sup> Nov<sup>em</sup>ber 30<sup>th</sup> 1881  
Wm. L. Brown Esq.  
Mendota Park N. J.

Dear Sir. Can we not aid you in building your experimental Electric Railway in Minnesota, by the purchase of such materials as Rails &c in Europe?

We have in store, consigned to us, some few hundreds of tons of 35 lbs. Iron Ties for immediate delivery if wanted.

Please let us hear from you as we feel sure, when our method is understood, you will unite with our other friends in saying we furnish you materials at a decided saving over the old plan. Very truly

Philip S. Justice  
Wm. L. Justice.

PHILIP S. JUSTICE

J. HOWARD MITCHELL

14 SOUTHAMPTON BLD'GS, CHANCERY LANE,  
— LONDON, —

ENGLAND.

14 NORTH 5TH STREET,

— PHILADELPHIA, —

PENNA.

**PHILIP S. JUSTICE & CO.**

COMMISSION MERCHANTS AND NEGOTIATORS

FOR THE PURCHASE OF

**IRON AND STEEL RAILS, BLOOMS,  
PIG IRON AND METALS GENERALLY.**

*We offer our services, both in AMERICA and EUROPE, as confidential agents for the purchase of RAILS, BLOOMS, PIG IRON, PLATES, &c., &c.*

*We feel sanguine of satisfying our friends in making contracts for their account, directly with the manufacturers, as our twenty-five years' experience has given us exceptionally good connections.*

*Buyers should bear in mind, that orders entrusted to ONE reliable and capable party, can be placed to far better advantage (and without disturbing values) than if quotations are asked for, from half a dozen sources.*

*We solicit a portion of your business, and to those unacquainted with our house, will give satisfactory references, on application.*

*Very Respectfully,*

**PHILIP S. JUSTICE & CO.**

CABLE ADDRESS,

—SYNO,  
LONDON—

Rail Road Securities Negotiated in London.

GOLD MEDAL—PARIS, 1878.



John Stephenson Company, Limited.

Street Cars and Omnibuses,

47 & 27th St.,

John Stephenson, President.  
A. C. NICHOLS, Sec'y. J. B. SEAWORTH, Treas.

New York, December 23/87

Prof. L. A. Edison  
Menlo Park, N.J.

For the Car ordered by  
Messrs. T. L. Hughes for the "Edison  
Electric Rail Road" will be finished  
to-morrow. We enclose Invoice hereunto,  
and will thank you to make remittance  
of the amount, with instructions as to  
mode of shipment.

Respectfully,  
J. B. Seaworth  
for the Company

For  
2  
2nd Road  
11/24/87



W. J. P. Folio 693  
Apr 1893  
D.C.

*D. Hedra. Ey*

Heintz Park of

**JOHN STEPHENSON COMPANY, Limited,**

47 East 27th Street,

*Dec*

To Mdse., as per Bill rend.

Net Cash for m/fk

689.00

J. M. P. R  
Mfg.

Please remit.

Railway Service Magazine  
Dec, 1881.

"Electricity as a railway motor is to be practically  
tried on the Northern Pacific R.R. in Minnesota  
according to the St. Paul Pioneer Press, which  
reports that President Villard has made a con-  
tract with Mr. A. Edison for the construction of  
fifty miles of road next year upon which the  
efficiency of Edison's Electric engines are to be  
tested. It will be strange if the far away  
States of Minnesota should witness the first  
practical proof of the success of this device.  
The excessive cost of fuel on the Northern  
Pacific is leading that company to search  
for a cheaper means of producing motive  
power, and this experiment may be in that  
direction (from Mr Edison's Scrap Books at  
Orange Laboratory, No 1)

Wm J. Hammer  
Mey 31-82

No. 725 Menlo Park Station, Nov. 5. 188

M. O. Edison

To PENNSYLVANIA R. R. CO. Dr.

For Freight from Railway per Manifest No. 2794

on Cooper's Bullock

Natural etc

MARKS	WEIGHT	RATE	AMOUNT
	iron	fr	660

Received Payment for the Company, Phillips Agent.

W. J. H. 11/10/88

No. 720 Menlo Park Station, Nov. 22. 188

M. O. Edison

To PENNSYLVANIA R. R. CO. Dr.

For Freight from Jersey City per Manifest No. 32494

on 6 Cast Iron V. Eng.

Mat. 5000 lbs.

MARKS	WEIGHT	RATE	AMOUNT
	1161	7	81

Received Payment for the Company, Phillips Agent.

W. J. H. 11/10/88

No. 747 Menlo Park Station, Nov. 15, 1887

*M. J. Edison*

To **PENNSYLVANIA R. R. CO. Dr.**  
For Freight from *West Chester, Pa.* per Manifest No. 4767

MARKS	WEIGHT	RATE	AMOUNT
1000 ft. Kynlock's sponge 27	2500 875	7. 2	18.75 16.94
<i>W. J. H.</i>			<i>Nov 1887</i>

Received Payment for the Company,  
*Philips* Agent.

No. 775 Menlo Park Station, Nov. 26, 1887

*M. J. Edison*

To **PENNSYLVANIA R. R. CO. Dr.**  
For Freight from *Jessy City* per Manifest No. 32947

MARKS	WEIGHT	RATE	AMOUNT
2675 ft. Royal Lumber <i>Edison House</i>	2675 175	7. 5	18.75 16.94
<i>W. J. H.</i>			<i>Nov 1887</i>

Received Payment for the Company,  
*Philips* Agent.

*See Printing  
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No. 763

Menlo Park

Station, Nov. 18, 1881

M. V. Edison

To PENNSYLVANIA R. R. CO. Dr.

For Freight from

New York

per Manifest No. 11783

on

1 Bal Japan  
Inc

Received Payment for the Company,

Phillips

Agent.

MARKS.	WEIGHT.	RATE.	AMOUNT.
	110	10	11
			W. J. H. Dec. 1896



No. 794 Menlo Park Station, Dec. 3, 188/

To M. J. Edison PENNSYLVANIA R. R. CO. Dr.

For Freight from Jessup City per Manifest No. 33630

on 2000 ft R Hicklock

Wmne Cfc

MARKS	WEIGHT	RATE	AMOUNT
	45.00	7	3.15

Received Payment for the Company, Phillips Agent.

W. J. H  
Dec 1896

No. 878 Menlo Park Station, Dec. 19, 188/

To M. J. Edison PENNSYLVANIA R. R. CO. Dr.

For Freight from Musauk per Manifest No. 17131

on 13 pcs Casting

Waterfall, Pa

MARKS	WEIGHT	RATE	AMOUNT
	80	8	2.40

Received Payment for the Company, Phillips Agent.

W. J. H  
Dec 1896

MARKS.	WEIGHT.	RATE.	AMOUNT.
Bals Castings	W 0	W J H 90 1-16	3
Earnable			

Payment for the Company,  
*Phillips* Agent.

100  
W. H. Dixon  
 For Freight from Kennington To PENNSYLVANIA R. R. CO. Dr  
 per Manifest No. 13915

MARKS.	WEIGHT.	RATE.	AMOUNT.
3 Kg 90 Spikes Kg 4 balls & nuts material life	650	12	78

Paid Payment for the Commission  
 Agent.

1000  
 1000



806 Menlo Park Station, Dec. 10, 1881

W. H. Edison To PENNSYLVANIA R. R. CO. Dr.

Freight from Jersey City per Manifest No. 24676

MARKS	WEIGHT	RATE	AMOUNT
	1205	7	88

Good Payment for the Company, Phillips Agent.

803 Menlo Park Station, Dec. 29, 1881

W. H. Edison To PENNSYLVANIA R. R. CO. Dr.

Freight from Rahway per Manifest No. 24678

MARKS	WEIGHT	RATE	AMOUNT
	7200	60	432

Good Payment for the Company, Phillips Agent.

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30 Geo. Mumlock (8x4x8)  
Materials A/c.

W. J. H.  
8x4x8  
60

Turn Table Pine 88  
 Material Iron 25  
 Clear On Pulver 25  
 Material Pulver 325  
 Lb 3

35  
 315  
 25  
 88  
 46

Laboratory of  
Thomas A. Edison

Menlo Park, N.J.

January 2<sup>d</sup>

1882

1881		Material and Expense for Engine Room	
Nov	22	To Patterson Bros Nails	3 40
"	23	To Cash Freight on Nails	40
"	26	To " Freight Cartage	56
"	26	To Vanderbeck and Sons Lumber	70 34
Dec	1	To C. F. Hughes Material and Exp.	3 16
"	1	To Pay Roll	19 20
"	30	To Cash Freight on Lumber	5 66
"	7	To " " on Hinges	10
"	8	To Pay Roll	19 50
"	6	To Patterson Bros Hinges	1 32
"	6	To mica Roofing Co Tar Paper	7 69
"	12	To Patterson Bros Hinges	1 20
"	15	To Pay Roll	39 00
"	13	To Cash Freight on Hinges and Paper	50
"	14	To " " on Tar Paper	19
"	22	To Pay Roll	19 25
"	23	To mica Roofing Co Tar Paper	3 00
"	24	To Cash Freight on Window Sash	12
"	29	To " " on Paper	08
"	29	To Pay Roll	9 00
			<u>193 37</u>

Laboratory of  
Thomas A. Edison

Wm. Parbetz

January 2<sup>d</sup>

1882

Rolling Stock Account

Dec	2	To Jersey Reitz Wheel Works for wheels	73	00
"	10	To Cash Cartage		50
"	22	To John Stephenson Cars	657	50
"	31	To Cash Freight on Cars	21	38
			765	38

Laboratory of  
Thomas A. Edison

Menlo Park, N.J.

January 2<sup>d</sup>

1882

1881 Material and Expense for Electrical Connections

Nov	17	To Bill Rendered	242	41
"	19	To Cash Freight on Copper		25
"	24	To Pay Roll	56	88
Dec	1	To " "	69	51
"	5	To Cash Pay Roll	4	05
"	3	To Manning Freeman Coal	5	50
"	5	To " " Coal	11	00
"	8	To Pay Roll	60	00
"	10	To Cash Freight on Tubes		25
"	8	To Electric Tube to Electric Tubing	30	25
"	8	To Manning Freeman Coal	1	11
"	11	To H. C. Ayers		72
"	15	To Pay Roll	16	00
"	12	To Cash Freight on Soft Coal	12	42
"	22	To Pay Roll	20	62
"	22	To H. C. Ayers Cartage on Coal	3	50
"	22	To S. P. Corman " "	1	25
"	29	To Pay Roll	20	62
			556	61

Laboratory of  
Thomas A. Edison

Menlo Park, N.J.

January 2<sup>d</sup>

1882

1881 Labor on Trucks

Nov	14	To Bill Rendered	55	85
"	24	To Pay Roll	11	40
Dec	1	To " "	11	73
"	8	To " "	41	48
"	10	To Cash		50
"	15	To Pay Roll	109	45
"	22	To " "	133	25
"	29	To " "	70	98
			437	64

Laboratory of  
Thomas A. Edison

Memorandum

January 2<sup>d</sup> 1882

		Material and Expense Ledger Table		
Oct	24	To Bill Received		78 63
Nov	14	To Patterson Bros Solder		3 63
"	22	To " "		4 50
"	24	To Pay Roll		15 00
"	23	To Cash Freight on Solder		25
"	29	To J L Mott. Caldwell	10	25
"	30	To Cash Freight on Caldwell		11
Dec	1	To C F Hughes Machine Fund Exp for bio	3	47
"	1	To Pay Roll		6 15
"	8	To " "		3 00
"	21	To Augustus Lufbery. Lumber	32	28
"	15	To Pay Roll		3 00
"	17	To Cash Freight on Lumber.		1 35
"	29	To Pay Roll		2 78
				164 46

Laboratory of  
Thomas A. Edison

Memo Book, N.Y.

January 2<sup>d</sup> 1882

1881	Right of Way for crossing Peoples Land	
Oct. 24	To Rice Purchase	517 19
		517 19



Laboratory of  
Thomas A. Edison

Menlo Park, N.J.

January - 2<sup>d</sup> 1882

1881		Material and Expenses for Ruby Salts		
Dec	8	To Cash	Freight on Salts	25
"	9	To Vanderbeck and Sons	Freight	27 54
"	10	To Cash	Edison Limited	9 58
"	13	To "	Freight on Salts	9 08
"	22	To Ray Roll		19 25
"	29	To "		19 50
				61 90

Laboratory of  
Thomas A. Edison

Menlo Park, N.J.

January 2<sup>nd</sup> 1881

1882

1881	Cost of Railroad to Dec 31 <sup>st</sup> 1881	1881
	Labor on Road Bed	1612 03
	Material and Expense on Tie Work	1480 13
	Material and Expense Insulation Dist.	1908 48
	Material and Expense for Track	3049 44
	Right of Way for crossing People's Ground	517 19
	Material and Expense for Laying cable	164 46
	Labor on Track	437 64
	Material and Expense for Electrical Connections	556 64
	Material and Expense for Engine House	193 37
	Rolling Stock Account	765 38
	Material and Expense for Time Table	61 93
		<u>8746 71</u>
	Locomotive	37 50
	Mechanics etc	17 00
		<u>14196 71</u>

85.0  
3  
1650

Laboratory of  
Thomas A. Edison

Menlo Park N.J.

January 2<sup>nd</sup> 1882

1881 Labor on Road Bed				
Nov	16	To Bill Rendered	1555	13
"	18	" Cash Row Share.		50
"	24	" Pay Roll	20	40
Dec	1	" " "	21	00
"	8	" " "	12	00
			1612	03

Laboratory of  
Thomas A. Edison

Menlo Park N.J.

January 2<sup>d</sup> 1882

1881. Material and Expenses on Dredge Work			
Oct	29	To Bill Received	530 28
"	31	To Agnes & Lumber	156 85
			480 13

No 1-2 photo

Laboratory of  
Thomas A. Edison

Menlo Park, N.J.

January 2<sup>d</sup>

1883

1881 Material and Expense - Immaterial - Jan - Dec.			
Nov	21	Bills Rendered	458 97
"	21	To Electric Tube Co Japan	43 12
"	22	To " " " Immaterial	64 65
"	24	To Pay Roll	26 25
"	23	To Cash Freight on Tar	2 22
"	26	To Cash " " Japan	27
"	29	To Cash " " Turpentine	50
"	28	To McHess and Robbins Turpentine	6 50
"	29	To J L M. M. Caldwell	10 25
"	30	To Cash Freight on Caldon	13
Dec	1	To C. F. Hughes Material and Exp	3 47
"	1	To Pay Roll	30 30
"	3	To Cash Freight on Tar	2 15
"	2	To Electric Tube Co Immaterial	64 22
"	8	To Pay Roll	29 25
"	8	To McHess and Robbins Benzine	2 00
"	6	To Mica Roofing Co Tar Paper	7 69
"	10	To Cash Cartage	50
"	10	To Cash Freight on Benzine and Tar	3 25
"	14	To Electric Tube Co Japan	43 12
"	15	To Pay Roll	30 35
"	13	To Cash Freight on Japan	27 24
			<u>829 43</u>

No 2- 24.1.15

Laboratory of  
Thomas A. Edison

Menlo Park N.J.

January 22

1882

1881 Incidentals Paid Continued

		Amount Forwarded.		
			829	13
Dec	15	To C. & R. Foughton Jan Paper		19
"	22	To Pay Roll	18	65
"	21	To Cash Freight on Jan	1	13
"	21	To Mica Roofing Co Jan Paper	3	00
"	22	To McKesson and Robbins Benzine	2	00
"	21	To Cash Freight on Benzine and Japan		77
"	29	To Cash " " Jan Paper		69
"	29	To Pay Roll	6	25
"	30	To Cash Freight on Benzine		50
"	31	To Electric Tube Co Japan	113	12
"	28	To McKesson and Robbins Benzine	3	35
			908	48

Laboratory of  
Thomas A. Edison

Menlo Park, N.J.

January 2<sup>d</sup> — 1882

1881		Material and Expense for Tracks	
Nov	10	To Rice Remitted	2902 01
"	11	To Patterson Road	2 47
"	23	To Cash Freight on Traps	51
"	22	To Pensioned Co	412 00
Dec	7	To Cash Freight on Mails	15
"	8	To " Taking Rail to N.Y. office	45
"	10	To " Freight on Iron	25
"	17	To " Freight on Ties	6 60
"	17	To " 1.3 miles Rice Ranch Road	55 00
"	20	To " 1.4 on Alg <sup>ns</sup> and Lumber <sup>25</sup>	50
"	27	To Pensioned Co	31 79
"	29	To Cash Freight on Ties and Bolts	7 38
			3049 44

GEO. F. GREEN,

MANUFACTURER OF

**ELECTRO MOTORS**

OFFICE, 132 ACADEMY ST.,

BOOK 1887. B

Kalamazoo, Mich., Jan. 6<sup>th</sup> 1882

Mr. T. A. Edison

No. 65 Fifth Avenue N. Y.



Dear sir,

Dec 19<sup>th</sup> I sent you a letter  
in reply to yours of Dec 15<sup>th</sup> but no  
answer yet. I gave you the first offer,  
and shall give you the first refusal.  
And if you do any thing in the matter  
you will have to do it soon, as other  
parties are coming along who show  
a willingness to take hold and help.  
Please return this newspaper statement  
I send you, and oblige

Yours Respectfully,

Geo. F. Green



[ENCLOSURE]

PAID  
JULY 30 1880

TO THE EDITOR OF THE TRANSACTS

I have been much interested this last season in watching the progress that is being made from time to time in electric railroads. In your valuable paper of Oct. 7th, 1879, on the 4th page (4th column), is a full description of an electric railroad gotten up in this town for carrying passengers and freight. The working and our you described was in a very advanced state of perfection, as you will readily see by examining the description you gave.

Now Dr. Warner Siemens' electric railroad, 1880, that were exhibited in Berlin, Germany, that last season, which is fully described in the February number of the *Scientific American*, page 127, also different descriptions of Mr. Edison's electric railroad is found in different numbers of the same paper, as well as other publications. Now what is surprising to me, is that these two men should keep inventing and experimenting, first one ahead and then the other, both, gradually approaching the description you gave in your paper of Oct. 7th, 1879. Now, my experience in that experimenting on electric railroads is very extensive. We are not too casually of things being clock, the lost aster etc. I have an old copy of that paper bearing the date referred to. I find it gives a description of a perfected electric railroad, "electric track" and everything complete. Now, if those inventors of electric railroads could have a copy of that old number of your good paper I believe it would help them.

Very respectfully,  
Geo. E. GARRISON

WJH

T. A. EDISON,

Menlo Park, N. J.

Jan 24 1887

Mr Samuel Insell  
Dear Sir.

We will have to use to finish the Railroad. We need a half ton of old rail and 2716 pairs of plates and bolts and nuts to match.

The plates complete with bolts and nuts cost 35¢ per pair.

The rails when bought cost 4¢ each per ton.

They now cost 5¢.

In charging them you will please your

series of causes as to the  
old & new prices. I am  
afraid we will be  
about 25 Rails short  
as we only had it seen  
about half a million at  
first and 1300 ft was  
sent to Brazil and  
about half of what I have  
taken up has to be stra-  
ightened and almost made  
lost.

Yours Truly  
Chas. F. Hughes.

1890  
Chas. F. Hughes  
24th Jan 92

147  
P. O. BOX 2187.

PIERSON & COMPANY.

ESTABLISHED 1700.

Iron and Steel and General Commission Merchants.

24 BROADWAY, AND 77 & 79 NEW STREET,

New York, Jan 10<sup>th</sup> 1882

Chas. T. Hughes Esq  
for J. A. Edison Esq  
Menlo Park N. J.

Dear Sir,

Are we to understand by yours of yesterday, that you countermand your order of Jan 7<sup>th</sup> "Send immediately 100 plain Fish Plates to Menlo Park", and do we understand that you do not wish any bolts or nuts for this 100 plain plates ordered,

You require as many plain Fish Plates with Bolts & Nuts as you have rails, and according to our invoices you have received from us 669 Rails, and we have only sent 550 plain Fish Plates, I would seem you require 119 more with bolts & nuts, please reply at once, and say how many plain fish plates also bolts & nuts you wish require now, as they have to be made specially and cannot be got in a hurry, and we regret you had better send us a pair of Fish Plates just right to fit the rail so the new ones will be right now, Very Respy, Yours  
P. Pearson



Laboratory of  
Thomas A. Edison

Menlo Park, N.J.

February, 1882

(Materials and Expense on Farm Table)

		To Bill Rendered	61	95
Jan	1	To C. F. Hughes Farm and Exp	3	60
	5	To Pay Roll	16	25
(50)	4	To Cash Freight on Castings		12
12	7	To Cash " " "		25
12	12	To Pay Roll	9	35
			91	57

Laboratory of  
Thomas A. Edison

Memo Book No.

February 1<sup>st</sup>

1882

Rolling Stock Account

Jan 5	To Billo Rendum	765	38
" 5	To 76 6 Ayms Carriage	1	50
" 5	To back Freight on Edgemo. & 41	13	27
		780	65

Laboratory of  
*Thomas A. Edison*

*Menlo Park, N.J.*

February 1<sup>st</sup> 1882

Material and Expenses for Electrical Connections

		To Bill Rendered	556	64
Jan	1	To Geo B Hewton Soft Coal	4	50
"	5	To Pay Roll	3	00
"	1	To L. High Valley Coal Co. Soft Coal	31	63
"	9	To Ansania Brass & Co. Copper Straps	75	95
"	19	To Pay Roll	18	63
"	23	To Cash Exp in New York		25
"	26	To Pay Roll	23	25
			712	85



Laboratory of  
Thomas A. Edison

Marble Parbet, J.

February 1<sup>st</sup> 1882.

Material and Expenses Laying Cable

Jan	1	To B. G. Ford	Nails	4	03
		To Bills Rendered		164	46
"	12	To Pay Roll		4	25
"	18	To Electric Tube Co	Tax &c.	106	44
"	19	To Pay Roll		8	00
"	19	To Cash	Freight on Saw	3	32
"	19	To Electric Tube Co	Tax &c.	94	36
"	23	To Cash	Freight on Saw	1	21
"	28	To Cash	Johnson on contract.	5	00
				391	09

Laboratory of  
Thomas A. Edison

Menlo Park, N. J.

February 1<sup>st</sup>

1882

Labor on Track

		To Bills Rendered	437	64
Jan	5	To Pay Roll	137	90
"	12	To Pay Roll	133	16
"	19	To Pay Roll	29	00
"	26	To Pay Roll	36	70
			774	40

Subsidiary of  
Thomas A. Edison

Menlo Park N.J.

February 1<sup>st</sup> 1883

Right of Way for Crossing Peoples Land

To Bill Rendell

517 19

517 19

Laboratory of  
Thomas A. Edison

Wentworth, N.J.

February, 1882

1882

Materials and Expenses for Track

		To Bill Rendered	3049	111
Jan	1	To C. S. Hughes	4	65
"	1	To Augusted Lufberry	595	56
"	1	To B. J. Ford	1	29
"	5	To Cash	9	23
"	12	To Cash	8	66
"	30	To Cash	35	
"	30	To Pension and also Fish Plates	7	50
"	31	To Cash	2	27
			3678	95

Laboratory of  
Thomas A. Edison

Menlo Park, N.J.

February 1<sup>st</sup> 1882

		<u>Material and Expenses Insulating Pipes and Rails</u>	
		To Bill Received	908 48
Jan	1	To C <sup>t</sup> Hughes Fare and Expenses	4 50
"	5	To Pay Roll	11 30
"	4	To Cash Freight on Angle Pieces	2 45
"	7	To Cash " on Benjamins	50
"	4	To McKesson and Robbins Benjamins	2 00
"	12	To Pay Roll	10 78
"	17	To Cash Freight on Benjamins	60
"	11	To McKesson and Robbins Benjamins	8 00
"	16	To R. Bergmann Angle Pieces	62 75
"	19	To Pay Roll	8 00
"	25	To Cash Freight on Paper	33
"	26	To Pay Roll	17 75
			<u>1037 44</u>

Laboratory of  
By Thomas A. Edison

Menlo Park, N.J.

February 1<sup>st</sup> 1882

Material and Expenses on Textile Work

To Bill Received

480	13
480	13

Laboratory of  
Thomas A. Edison

Menlo Park, N.J.

Feb 1<sup>st</sup>

1882

Balance on Road Bcd

To Bill Rendered

1612 03

1612 03

Laboratory of  
Thomas A. Edison

Menlo Park, N.J.

February 1<sup>st</sup>

1882

Cost of Railroads to Feb. 1<sup>st</sup> 1882

Labor on Road Bed	1612	89
Material and Expenses on Track Work	456	19
Material and Expenses Insulating Poles, &c.	1057	44
Material and Expenses For Track	3625	25
Right of Way Crossing Bridges Land	517	19
Material and Expenses Laying Cable	391	69
Labor on Track	774	40
Material and Expenses for Electrical Connections	712	85
Material and Expenses for Engine Houses	216	56
Rolling Stock &c	780	65
Materials and Expenses on Sun for 161	91	34
	10292	86



Laboratory of  
Thomas A. Edison

Menlo Park, N.J.

February 1<sup>st</sup>

1882

(Material and Expenses for Engraving House)

		To Bill Rendell	193	37
Jan	1	To L S Hughes Nails Hinges Saw & Exp	3	50
"	1	To A J Butler Window Rash	14	00
"	5	To Pay Roll	3	75
"	12	To Pay Roll		75
"	25	To Photocopy Anna Picklock & Harp	1	59
			216	56

WASH  
T. A. EDISON,  
Pills

Menlo Park, N. J.,

Elie B. B.  
Feb 2<sup>nd</sup> 1882

Wash.

Mr. T. A. Edison.

Dear Sir.

The dynamos  
are in place and  
the Motor and the Truck.  
Same of the connect-  
ions to it it would  
trouble me to put to-  
gether without a dia-  
gram of them. Will you  
have them sent to me.

As we have no Turn  
Table or branch to it  
same reversing gear  
will be necessary if  
we are going to run  
it at all.

Yours Truly,

Chas. T. Hughes.

Page 337 Letter Book 'A' Edison Laboratory?

44<sup>th</sup> Feb-1882

Edw. H. Johnson Esq.

57 Holborn Viaduct  
London, E.C., England.

My Dear Sir.

You remember probably the Elevator in  
Stewart's Building 11 Queen Victoria Street-London  
E.C. Mr Edison is working for use on an  
having a series of cars for use on an  
Elevated Electric Railroad his idea being  
to run an elevator by motors for Passengers  
to ascend and descend instead of using  
stairs such as those used on the New  
York Elevated Rail Road.

Men in the neighborhood of Queen  
Victoria St- will you kindly look into  
No 11 & then give us the benefit of your  
views as to the adaptability of the Elevator  
to there to the purpose above referred to

Yours truly  
James Russell

(W. J. Hammer  
mch 26-98)

*W. J. H.*  
T. A. EDISON  
*W. J. H.*

W.J.H. ~~Dec. R. R.~~

Menlo Park, N. J., Feb 13 1882

Mr Edison

I made the connections in Locomotive, and find several weak points, There wants to be a ratchet between the armature and the switch enabling the starter to throw in resistance while starting then turning out as speed is obtained, Also the reverse switch wants altering. It wants to brake with a spring so as to prevent sparking.

I also connected the field magnet in multiple  
ark and inserted ten ohms resistance, and it  
started quite easy.

Mr Vander and my self eased all the  
barings, one Man being able to start goods  
easily on the wheel.

I also find the present belt tighter  
if little or no use as it is on the <sup>wrong</sup> side  
of ~~any~~ <sup>the</sup> belt, if belt is made loose enough to  
let signature slip the tightness will not  
take up the slack. Mr. Hues said he  
would not do anything for a few days

on the railroad as the ground is so  
soft and tracks crushed by the frost.

I should like to know what to  
go on with next

John. F. O'H.

W.H.  
T. A. EDISON,  
J.E.

Ele. R. R.  
Feb 14 1887  
Menlo Park, N. J.  
Angus

Mr. J. H. Edison

Dear Sir

The Warner  
Clutch has arrived  
and I have taken the  
shaft out and shall  
put the clutch on as  
soon as possible. The  
shaft will have to be  
turned down about 1/16  
of an inch and the  
hub of Pulley turned  
down to allow it to  
go into its proper place.  
There will also have  
to be a lever and ful-  
crum made and  
other changes which  
will take consider-  
able time. so that

we will not be able  
to run in a couple  
of days probably.

Will let you know  
by Telegraph when  
we will be ready.

Yours Truly,  
Chas. F. Hughes

M. J. M.  
T. A. EDISON,

Pell

Menlo Park, N. J.

Eliz. R. R.

Feb 14 1887  
Angus

Kindly send a letter  
from Messrs Ayers &  
Lufberry (from whom  
we got the timber  
for Pine) in which  
they say that they  
were promised the  
money two weeks ago  
and are very much  
in need of it. Can't  
you do something  
for them. The amount  
is quite large and  
the firm is in need  
it is no doubt hard  
scratching to get  
along. The Motor is in  
shape to run and  
work in much better



shape than ever but  
as the present configura-  
-tion is a "D" and the  
resistance much  
lower. I don't like  
to start it with-  
-out the Boss  
when he is coming  
out. I sent your  
check by Adams  
Ex chgs prepaid last  
night. Yours Truly  
Chas. T. Hughes

H  
W. H.  
T. A. EDISON,

Esq. R. B.

Hughes

Menlo Park, N. J.

Feb 17 1887

Mr. T. A. Edison.

Dear Sir,

Tried the "B"  
Armature today in all  
the safe ways I could  
think of. But it didn't  
work at all well.  
Did not dare take out  
any of the resistance  
in the Armature cir-  
cuit.

Tried putting more  
in but didn't succeed  
ed in heating it and  
did no good. Also took  
the extra resistance  
from the field which  
helped it some, but  
not enough to make  
the thing a glancing

success. If you are not  
coming out soon and  
can find any suggest-  
-ion together with the  
"A" Armature I should  
like it very much..

The Clutch is on and  
works splendidly and  
I am confident that  
with the "A" will be  
all right. Have the  
gear rails over  
the first Trestle  
and am having the  
track which is ball-  
asted put in line

T. A. EDISON,

Menlo Park, N. J., \_\_\_\_\_ 1881.

The Motor since the  
belts have been  
taken up runs a  
little hard and un-  
less we can improve  
it shall jack the  
whole thing up and  
take the wheels out  
but I guess we can  
fix it without as  
it runs much better  
than when you were  
here.

Yours truly  
Chas. T. Hughes.

401 Cherry St.

Philadelphia Pa.

Thomas A. Edison Esq.

July 22<sup>nd</sup> 1882

Inventor, Electrician

New York

My dear Sir -

Yours of the 13<sup>th</sup> just received thanks -

I now come to ask you to please send me a  
brief of your Electric R.R. which you are to  
build for Port Villars & when you will build it.  
I believe you have printed pamphlets of it. -

I ask this as I desire to write articles will  
send copies of paper to you, I ask this information  
if it be proper and as an old operator now  
in newspaper business - If not troubling  
you would like the above soon and wishing  
success in all your undertakings let

me to

Yours very respectfully

R. M. Hughes

77- CATHARTHE  
Printer, Binder and Stationer  
NEWARK, N.J.

Rolling Stock.	\$ 4742.35
Cable	841.06
Turn Table	202.30
Engine House	217.17
Histles	480.13
Track Material	3722.02
do Labor	887.78
Road Bed	1612.03
Electrical Connections	786.53
Insulation	1138.95
Right of way	517.19
<del>Overhead</del>	
Central Station	7336.38
	<hr/> 17338.89
Track Material	
Old Rails on hand	882.
16 tons @ \$52 =	<hr/> 18165.89

Freight Estimate  
 10 Cars @ \$180 = 1800  
 Freight Locomotive 3000

\$ 4800

Material for track  
 Shit required \$  
 2000 Lono rails @ \$0.25 104  
 Pick Plates (35) @ \$5 12.35  
 500 Ties 25.37  
 Ballast \$ 241.72

Labor on track { 800  
 & Electrical Connections }

Insulation 20  
 Loading Percent Track 50

Cost of Road Rolling  
Stack Central  
Station &c to date } 18165.7

Estimate further cost

Rolling Stock	4800.
material Track	241.72
Labor do	850.
Insulation do	25.

	24082.61
Operating Expenses	134.10
	<u>\$24216.71</u>

Say total cost of road  
\$25000.



Operating Expenses 134.10

T. A. EDISON,  
Menlo Park, N. J.

Electric Rail Road

Estimate total cost

25 February 1882

①  
No 20

Cost of road  
Feb 25 '82  
\$25,000.00

J. F. BAILEY, Pres't.  
THOS. THOMAS, Treas. and Genl. Mgr.

OFFICE OF

Geo. C. THOMAS, Sec'y.  
Jas. DAYTON, Supt.

The Jersey City Wheel Foundry and Machine Works,



CHILLED AND STEEL-TIRED CAR WHEELS.

P. O. Box 129,

NEW YORK OFFICE,  
24 BROADWAY,  
ROOM 33.

*Jersey City, N. J. July 28 1882*

A. A. Edison Exp.

*Union Park*

Dear Sir A. A.

*Yours of 27<sup>th</sup> rec'd.*  
*We will draw off and*  
*grind finish the 4 per.*  
*of wheels and set them*  
*to new gauge for 2.00 per*  
*pair. Very truly yours*

*Proctor Thomas*  
*Treas.*

NO APPLIANCE OR APPARATUS OR MACHINE CONNECTED WITH THE EDISON  
EDISON SYSTEM OF ELECTRIC RAILROADS SHALL BE USED FOR PRODUCING  
ELECTRIC LIGHTS OR CURRENTS THEREOF.

Nat'l. T. C. N. Soc. Mtg. Th. Eve.  
Stevens - Public Pl. Co. of Am. }  
Mch. Natl. Lib. Cl. Co. Ind  
"Dependants' Relief Bill" ~~Widow~~  
Contract, ~~Sept 1881~~ dated June 19, 1882.  
J. A. Bell Esq.  
Appl. 13/10/82.

3 Dups signed  
factory of which  
this is one.

SECOND. THE PROVISIONS OF THE FOREGOING FIRST SECTION ARE TO EXTEND TO AND INCLUDE ALL IMPROVEMENTS WHICH THE PARTY OF THE FIRST PART MAY HEREAFTER MAKE UPON THE AFORESAID INVENTIONS, FOR A PERIOD OF EIGHT YEARS.

THIRD. IT IS EXPRESSLY UNDERSTOOD THAT THIS INDENTURE RELATES ONLY TO INVENTIONS PERTAINING TO THE EDISON SYSTEM OF ELECTRIC RAILROADS AND TO NO OTHER INVENTIONS WHATSOEVER, AND THAT IT IS LIMITED TO SWITZERLAND, AND THAT NO LICENSES OR CONCESSIONS ARE TO BE MADE, OR APPLIANCES MADE OR SOLD TO BE USED OUT OF THAT COUNTRY.

FOURTH. THE PARTY OF THE FIRST PART IS TO DIRECT WHAT IS TO BE USED IN THE PRACTICAL WORKINGS OF HIS SYSTEM, AND NO METHODS THERE- OR MEANS OR DEVICES ARE TO BE USED IN CONNECTION WITH OR INTRODUCED THEREIN EXCEPT UPON HIS WRITTEN APPROVAL.

FIFTH. THE PARTIES OF THE SECOND PART AGREE THAT NO LICENSE UNDER OR CONCESSION OR SALE OF ALL OR OF ANY PORTION OF THE RIGHTS HEREIN CONFERRED IS TO BE MADE WITHOUT THE WRITTEN CONSENT OF THE PARTY OF THE FIRST PART, AND THAT THEY WILL NOT SELL LICENSE OR IN ANY MANNER CONVEY RIGHTS IN ANY OF THE INVENTIONS OR DEVICES HEREIN INCLUDED AT A PRICE LOWER THAN TO YIELD TO THE PARTY OF THE FIRST PART, TEN PER CENT OF GROSS RECEIPTS. IN NO CASE SHALL THE SAID PARTY OF THE FIRST PART RECEIVE LESS THAN TEN PER CENT ON THE GROSS RECEIPTS.

SIXTH. THE PARTY OF THE FIRST PART AGREES TO SEND TO GENEVA AS SOON AS HE CAN CONVENIENTLY DO SO, A SKILLED WORKMAN FROM HIS LABORATORY, UNDERSTANDING THE MANUFACTURE OF THE DEVICES USED IN THE SYSTEM AND THEIR OPERATION WHO SHALL GIVE THE INSTRUCTIONS NECESSARY TO THE COMMENCEMENT OF THE MANUFACTURE OF THE DEVICES AND THE OPERATION OF THE SYSTEM, AT THE EXPENSE OF SAID BIDDER.

2

MANN AND HAVEMEYER.

SEVENTH. THE PARTIES OF THE SECOND PART AGREE TO PAY THE WHOLE COST OF ESTABLISHING ~~THE~~ ANY WORKS OR MANUFACTURING NECESSARY TO THE CARRYING OUT OF THIS AGREEMENT, ALSO THE EXPLOITATION EXPENSES, AND ALSO AGREE TO PURCHASE FROM SAID EDISON, WITHIN SIX MONTHS FROM THE DATE HEREOF ONE ELECTRIC LOCOMOTIVE AT COST PRICE.

EIGHTH. IN CONSIDERATION OF THE FOREGOING, THE PARTIES OF THE SECOND PART AGREE TO PAY TO THE PARTY OF THE FIRST PART, ONE HALF, (FIFTY PER CENTUM) OF THE NET PROFITS ARISING FROM ANY AND ALL TRANSACTIONS, AGREEMENTS OR SALES OF THE INVENTIONS HEREIN REFERRED OR OF THE RIGHTS HEREIN TRANSFERRED, OR LICENSES, AGREEING FURTHER THAT THE PARTY OF THE FIRST PART SHALL NOT BE RESPONSIBLE OR LIABLE FOR ANY PORTION OF ANY LOSSES WHICH MAY BE INCURRED IN ANY OR ALL OF SUCH TRANSACTIONS OR SALES, IT BEING UNDERSTOOD THAT IF THERE BE ANY LOSSES, THEY ARE TO BE BORNE ENTIRELY BY THE PARTIES OF THE SECOND PART.

NINTH. THE PARTIES OF THE SECOND PART AGREE TO RENDER UNDER OATH TO THE PARTY OF THE FIRST PART, ON THE FIRST DAY OF MAY IN EACH YEAR, AN INVENTORY AND ACCOUNT AND BALANCE SHEET OF ALL TRANSACTIONS AND SALES OF THE YEAR ENDING ON THE PRECEDING LAST DAY OF APRIL, SHOWING THE NET PROFITS; AND TO PAY ON SAID FIRST DAY OF MAY TO THE PARTY OF THE FIRST PART, OR SOONER IF THE SAID PARTY OF THE FIRST PART MAY DEMAND, THE PORTION OF PROFITS SECURED TO HIM IN THE EIGHTH ARTICLE.

TENTH. THE PARTY OF THE FIRST PART SHALL HAVE THE RIGHT AT ANY TIME EITHER IN PERSON OR BY DULY AUTHORIZED AGENT, TO INSPECT AND EXAMINE ALL THE BOOKS OF ACCOUNTS OF THE PARTIES OF THE SECOND PART, IN ORDER TO VERIFY THE STATEMENTS PROVIDED FOR IN

THE NINTH ARTICLE.

ELEVENTH. THIS CONTRACT IS TO BE IN FULL FORCE AND BINDING UPON ALL CONCERNED FROM AND AFTER ITS SIGNING BY ALL THE PARTIES INTERESTED, AND THE TERM OF FIFTEEN YEARS PROVIDED FOR IN THE FIRST ARTICLE IS TO COMMENCE UPON THE DAY WHEN THE FIRST SYSTEM IS FIRST PUT INTO ACTUAL OPERATION IN ANY PART OF THE WORLD.

IN WITNESS WHEREOF, WE HAVE HERETO SET OUR HANDS AND SEALS (IN DUPLICATE) UPON THE DATES HEREINBEFORE

NOTED

IN PRESENCE OF

*Samuel Insull*  
*James H. Crocker*

*Thomas A. Edison*

*L. U. Havemeyer*  
*Samuel D. Warren*



STATE OF  
CITY OF  
COUNTY OF

SS:-

ON THIS DAY OF 1882, BEFORE ME

PERSONALLY APPEARED

TO ME KNOWN AND BY ME KNOWN TO BE THE INDIVIDUALS DESCRIBED IN AND WHO EXECUTED THE FOREGOING INSTRUMENT, AND WHO SEVERALLY ACKNOWLEDGED THAT THEY EXECUTED THE SAME.

J. F. BAILEY, Pres't.  
THOS. THOMAS, Treas. and Gen. Agt.

OFFICE OF

THOS. C. THOMAS, Sec'y.  
JAS. DAVEN, Asst.

The Jersey City Wheel Foundry and Machine Works,



CHILLED AND STEEL-TIRED CAR WHEELS.

P. O. Box 129,

NEW YORK OFFICE,  
64 Broadway,  
Room 55.

Jersey City, N. J. March 1882

Chas. J. Hughes Esq.  
Meadow Brook  
Reading N. J.

Yours of 8<sup>th</sup> inst. recd.  
We will change the gauge  
of wheels to enclosed sketch  
except thanks for invita-  
tion to ride over the "one  
mile track".

Will let you know a day  
or two before coming out  
Very truly Yours  
Thos. C. Thomas  
President

Return to  
JERSEY CITY WHEEL FOUNDRY & MACHINE WORKS,  
P. O. Box 129, JERSEY CITY, N. J.,  
If not delivered within 10 days.



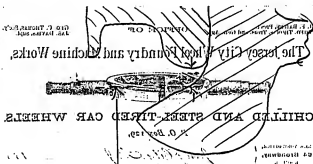
Chas. J. Hughes Esq.  
Meadow Brook  
New Jersey

S. A. Edwards Esq.

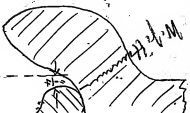
Return to  
 JERSEY CITY WHEEL FOUNDRY & MACHINE WORKS,  
 P. O. Box 120, JERSEY CITY, N. J.,  
 If not delivered within 10 days.



*Mr. J. Hughes Esq.*  
*Went Park*  
*New Jersey*  
*J. A. Edison Esq.*



*31-5 1/2"*  
*31-5 1/2"*  
*31-5 1/2"*





7/24  
 Philadelphia  
 The Rail Road Press.  
 THE PRESS COMPANY, (LIMITED) PROPRIETORS  
 SEVENTH AND CHESTNUT STREETS.  
 EDITORIAL ROOMS.  
 would you please send me  
 some  
 information  
 at once  
 as I am in  
 haste

Will you please send me  
 a printed pamphlet on  
 Your Electric Ry (if you have  
 such) and the light as it is &  
 I ask this information because  
 I want to write your <sup>inventions</sup>  
 ideas to see Mr. Bentley here  
 and can some of them, but the  
 light RR especially I want  
 providing the facts in paper  
 I will do away with it in  
 return - Yours Very Respectfully  
 R. M. Hughes

The Edison Electric Light Company,

65 Fifth Avenue,

Menlo Park, N. J.  
S. S. Eaton, Vice-Pres.  
E. P. Fahs, Treas.  
C. Goodland, Secy.

New York, March 3rd.

1882

C. G. Curtis, Esq.

City.

Dear Sir:-

Major Eaton directs me to inform you that probably the electric railway will be run at Menlo Park tomorrow afternoon, when several railroad men will probably visit Menlo Park, leaving New York on the one o'clock train to inspect the road. Should you desire to witness the test, will you please go to Menlo Park on the one o'clock train, and present this letter to Mr. Insull, or to Mr. Hughes, and they will show you every courtesy? Will you please say to them at the same time that you are one of the electrical experts regularly retained by this company.

Very truly yours,

F. Mc. Gowan,

Stenographer.

W. J. No. 1598  
Received  
\$14.50  
Arthur & Russell, N. Y.

Memo Park, N. J. Mar 11 1882

Received from THOMAS A EDISON,  
Dollars,

(Check No. 535) Bank of Metropolis  
for Travel

James M. Neal  
Super't.

Pennsylvania Rail Road Co.

N. J. Hann  
NOTED,  
James M. Hann  
Sept

New York Division.  
Office of Superintendent.

Jersey City, N. J. May 28 1882.

Subject Sheds now being built at Paterson Junction.

Mr. Chas. T. Hughes,  
Montic Park, N. J.

Dear Sir:

I am in receipt of your favor of March 25<sup>th</sup> in regard to the contents of ashes at Paterson Junction.

In reply would say that it is intended to use the material referred to, in making the connection between the Paterson Branch and the Central Rail Road of New Jersey.

It is very important to have the necessary work at that point completed immediately, and I request therefore, that I shall be enabled to oblige you with the desired material. Yours truly,  
James M. Hann  
Sept 18

J. F. BAILEY, President.  
THEO. THOMAS, Treas. and Gen. Mgr.

OFFICE OF

GEORGE THOMAS, Secretary.  
JAS. DAVIES, Superintendent.

The Jersey City Wheel Foundry and Machine Works,



CHILLED AND STEEL-TIRED CAR WHEELS.

NEW YORK OFFICE,  
64 Broadway,  
Room 12.

P.O. Box 129, Jersey City, N.J., Made Oct 1882

W.C. H. H. H.  
Messrs. A. C. Brown & Co.  
New York  
Dear Sir,

In answer to your inquiry, we  
will furnish 20 pairs of 18" single  
plate wheels fitted to 2 1/2" axles, say  
4" 6" long, complete with pedestals  
boxes, brass bearings, and springs  
for 24" axle pins in cars Jersey City.

Very truly yours  
J. F. Bailey  
Jas. Davies

P.S.

One wheel in each axle  
to be insulated, and  
oak filling to be in  
six segments  
18 bolts.

Accepted  
David's order  
Hugues

[TO SAMUEL INSULL.]

44  
N.Y. N.Y.  
The  Press  
THE PRESS COMPANY, (Limited,) Proprietors.  
SEVENTH AND CHESTNUT STREETS.  
Philadelphia, March 12, 1882.  
EDITORIAL ROOMS.

Samuel Insull, Esq.,  
Private Secy of Mr. Edison.

No 65- 5- av my

My Dnrs-

Yours of the 8th inst was received  
Thursday, I was engaged as stenographer  
Friday, hence I could not get down to  
see the Electric Co. at Muncie Park  
and I am sorry for I have been  
wanting to see it since I first read  
of it. The printed work thereon  
I received, and for which thanks  
In writing the article I shall  
insert entirely as I see it meets  
your approval. I shall be very  
much obliged if you will let me  
know when you commence laying wire  
supplying Niagara with light, also when  
you are to test the Electric Ry at  
Muncie Park again - I wish also to

to know the date <sup>or month</sup> you will buy  
Electric Irons for Mrs Villard &  
at what point on the Northern  
Pacific Line so I can go there  
to write it up - I hope I can  
not trouble you too much  
but if I can be of any service  
pls let me know & I will  
be pleased to go at any  
favor possible within my  
power, again thanking you for  
kindness in past, bless me

I am

Very Respectfully Yours

R. M. Hughes,

J. F. BAILEY, President.  
THEO. THOMAS, Treas. and Gen. Agt.

OFFICE OF

OEO. G. THOMAS, Secretary.  
JAS. DAVIES, Superintendent.

W. P. Howell

**The Jersey City Wheel Foundry and Machine Works,**



## CHILLED AND STEEL-TIRED CAR WHEELS.

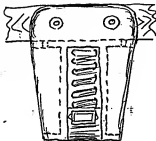
P.O. Box 129, Jersey City, N. J., March 1882

Chas. F. Hughes Esq.  
Minto Park  
N. D.

Dear Sir

Answering Yours of 20<sup>th</sup> inst,  
Each pedestal will require 4 Bolts  
through frame as per sketch below.

Very truly, Yours  
Frederic Thomas  
Fisher.



5/8" Bolts are heavy  
Enough



J. F. BAILEY, Pres't,  
THOS. THOMAS, Sec'y, and Gen. Agt.

OFFICE OF

GEO. C. THOMAS, Sec'y,  
JAS. DAVISON, Supt.

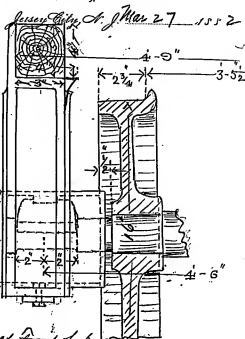
The Jersey City Wheel Foundry and Machine Works,



CHILLED AND STEEL-TIRED CAR WHEELS.

P. O. Box 129,

NEW YORK OFFICE,  
66 Broadway,  
ROOM 25.



*Drawn on each side to be  
mimulated with wood*

*1/2" Recession of front hub.  
4'-9" outside of side sills  
3'-5 1/2" gauge of wheels; for 3'-6" track  
2 3/4" bread of wheels*

*W. H. H. H.*  
DICTATED,  
James M. McLean,  
Supt.

Pennsylvania Rail Road Co.  
New York Division  
Office of Superintendents

Jersey City, N. J. *May 11<sup>th</sup> 1882*

Subject Gravel for Mr. Edison

Mr. Chas. J. Hughes,  
c/o Thos. A. Edison Esq.,  
Monto Park.

Dear Sir:

Referring to  
our interview of the other  
day, I would say that we  
can probably furnish Mr.  
Edison with the gravel request-  
ed, some time next week.

Yours truly,  
James M. McLean  
Supt.



WALTER A. JONES, PRES. & TREAS.

Schenectady, N.Y., May, 27<sup>th</sup> 1892

J. A. Edison Esq,  
65 Fifth Ave., New York,  
Dear Sir,

Yours of the 21<sup>st</sup> came during the absence of the writer hence delay in reply. We have no patterns of just such a car as your letter & drawing calls for, and it would not pay us to get up patterns for one car unless we ask an extra high price for the car and thus cover the outlay for patterns etc. We believe some of our first class street car designs lengthened out to 20 ft. would be better adapted to the purpose, rather than depart from the regular form. As to the roof we believe one similar to the enclosed cut would be preferable to such as your drawing calls for. We could furnish car body ready to receive the



WALTER A. JONES, PRESIDENT

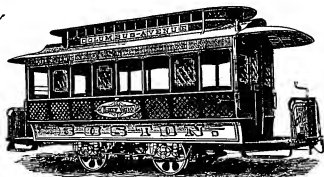
Schenectady, N.Y. 12304

1881

running gear or trucks, painted in  
elaborate manner, & finished inside in  
mahogany, & metal trimmings of bronze  
and to be first class in all particulars -  
at \$200, delivered at depot in New York.  
We could make Car of same dimensions  
and omit fancy finish completely and  
yet retain all that is strong & substantial  
and make price \$900. The price would  
be governed entirely by the amount of  
fine finish wanted. We would ask  
\$100 to eight weeks to complete car  
after having received the order.

Yours Very Truly  
Wm. A. Jones  
Pres

We return with this the tracing,



Pat.

J. M. JONES & CO., MANUFACTURERS, WEST TROY, N. Y.

My N.

T. A. EDISON,

Eliz. Rail Road

Menlo Park, N. J.

Mar 31<sup>st</sup> 1884

Highway

Mr. F. Insull.

Dear Sir,

I wish  
you would find  
out and send me  
word by Johnnie  
whether Mr Edison  
is coming out  
today and also  
whether he wants  
to run Sunday  
so that I can pro-  
-vide the Engineer.

Yours  
Charles

197

The



Eliz. Rail Road  
Press.

THE PRESS COMPANY, Limited, Proprietors.

SEVENTH AND CHESTNUT STREETS.

EDITORIAL ROOMS.

RECEIVED  
APR 2 1882  
Philadelphia

1882.

Samuel M. May  
Care of Thos. Edison

Sirs: Please excuse if I do not  
spell your name correctly. Really  
I cannot tell just what it is -  
Please write it plainly & I am not  
I have not heard from you in  
reply to my last letter, after which  
the test of the Electric Ry is over  
made. Nor about the Villard  
Enterprise. I write to ask if  
it Mr. Amistad could like  
the information to send some  
one there, or go myself could to  
write an article. Please reply & I am  
Yours very respectfully  
R. M. Hughes.

Addressed Post-Office, Leno

RECEIVED

APR 14 1882

ANSWERED

17-24-1882

Winnipeg, Manitoba

5 April 1882

— Edison Co.

New York, U.S.

Dear

A street tramway is about to be constructed here, and I have been trying to induce the Company to adopt the Electric Motor, and have been requested to get the cost per mile, with full particulars. I believe I can procure the contract for you - Would you kindly forward same by return, and in quoting a price, please reserve 5% Commission for me.

Yours truly

J. H. Pullar

P.S.

I procured the construction of the  
Water Works for Messrs. Leidlows & Co. Glasgow  
Scotland



W. B. B.  
T. A. EDISON.  
*Answer*

RECEIVED  
APR 10 1882  
MORRIS J.  
ANSWERED

W. B. B.  
*Hughes*  
Apr 8 1882

W. B. B.  
Mr. T. A. Edison  
Dear Sir.

It will be  
necessary to have at  
least two of the "7th"  
belts taken up and  
it will take about  
two days to do it.  
Is there any thing of  
importance on hand  
that will prevent it  
being done at once  
or shall we wait  
Yours truly  
Chas. F. Hughes

*Not  
sent  
over  
this*

THE CLEVELAND, PAINEVILLE & ASHTABULA RAILROAD COMPANY.

ANSWERED

CLEVELAND, OHIO.

*April 8 1882*

Thos Edison Esq  
Hunts Park New York  
Sir

Have you perfected a motive power that is  
better than <sup>steam</sup> for drawing Street Cars or Cars  
on a Suburban R.R. If so please send a  
full description stating the cost and  
where it can be seen

Respectfully

G. E. Lewis

J. G. BRILL,  
GEO. W. BRILL,  
JAMES RAWLE.

Office of J. G. BRILL & CO.  
CAR BUILDERS,  
Thirty-first and Chestnut Sts.

Philadelphia,

APR 11 1882

ANSWERED

Dec R. B.

Apr 12 82

Brill & Co

Car

10 10

1882

Thos. A. Edison.....

65-5th Ave - N. Y.

Dear Sir

Your favor of 8th  
trading the one car body  
has been received & shall have  
our attention.

We can complete it in four  
weeks-

Very truly Yrs

J. G. Brill & Co.

\*  
J. P. EDISON.

Dec 11 '88

Menlo Park, N. J.

Apr 11 1889

Mr. Saml. Insull

Dear Sir: Haro telegraphed the Belh  
to know when they  
can send a man  
to take up our belts  
and to Babcock &  
Wilcox to send a  
man to clean the  
boilers at the  
same time. It will  
probably take two  
or three days for  
them to get it  
and until that time  
the R.R. will be run-  
ning. It will only  
take about two

to be ready to run  
again.

Yours truly  
Chas. T. Hughes

P.S.  
Tell Mr Edison  
that the cable insulation  
yesterday a bad day  
was more than 2500  
and the Fraetls 105  
ohms.

CH

*H. P.*  
*Edison*  
THE EDISON COMPANY  
FOR ISOLATED LIGHTING.

*Geo. N. R.*  
CHICAGO AGENCY,  
ROOM 2143 LA SALLE ST.,  
*Bliss*  
CHICAGO, ILL. APRIL 14TH, 1882.

FRIEND EDISON:

THE EDITOR OF THE RAILWAY AGE HAS REQUESTED ME TO WRITE UP YOUR ELECTRIC RAILWAY FOR THEM.

PLEASE SEND ME SUCH PRINTED MATTER AS YOU HAVE GIVING FACTS.

ANY FRESH INFORMATION NOT IN PRINT WHICH YOU CARE TO HAVE USED I SHALL BE GLAD TO RECEIIVE.

PLEASE GIVE ME THE PRESENT STATUS OF THE ROADBED, ELECTRIC ENGINE AND COACHES AND FREIGHT CARS.

SINCERELY YOURS,

*Geo. N. R.*

THOMAS A. EDISON,  
NO. 65 FIFTH AVENUE,

NEW YORK.

April 17<sup>th</sup> 1888.

44-4  
24-1  
Chas. T. Hughes, Esq.  
New York City.

Friend Hughes,

Enclosed you will find tracing of Brass King  
I want made for this motor.  
Mr. Brown requested me to send it to you to have  
a pattern and castings made.  
Please send the same as soon as finished to Mr. J. C. Wheel Foundry.

Yours Respectfully

T. A. Edison

P.S. Think I shall let out to see you some time this week.

T. A. EDISON,

RECEIVED  
APR 19 1882  
Menlo Park  
ANSWERED

Apr 18<sup>th</sup> 1882

Mr. Thos A. Edison.

Dear Sir

The high  
resistance Armature  
proves to be 1.2 ohms  
instead of 2.74 ohms  
as ordered.

If you  
are anxious to try  
the 2.74 it will be  
necessary to order  
one. We have at pres-  
ent here

- 1 - 1.14 ohm
- 1 - .56 "
- 1 - 1.2 "

The 1.2 Armature when  
put in showed a cross  
between the brass angle  
pieces at three dif.



Forest places caused  
by the brass wire  
with which it is wound  
at that place coming  
in contact with the  
brass where the band  
had been soldered.  
The soldering iron  
had probably charred  
the canvas at that  
point. Moral! use  
fish line. The appli-  
cation is not in fur-  
ish as the current  
didn't have to go into  
it

Yours Truly  
Chas. T. Hughes

A. EDISON,

Dec R. 12

Amherst

Menlo Park, N. J.

Apr 19 1882

Mr. Jas A. Edison.

Dear Sir,

Would it  
not be a good plan  
in minding the  
Magnets for the  
Freight locomotive  
to have the ends of  
different layers exposed  
so that we can cut  
out or put in res-  
istance until we as-  
ertain the exact  
amount necessary  
to give the most power.  
I find with the .56  
Amature that even  
when there is but  
10 ohms resistance  
in the field the Am-  
ature gets quite hot.

in making half a dozen  
trips with heavy loads  
say four tons.

In turning  
the Locomotive the  
polarity of the Mag-  
nets will be changed  
every time. Is that  
desirable or not.

Yours Truly  
Chas. T. Hughes

4 27/10 7 8  
4 27/10 7 8  
7 0 27/10 6 6  
2 1/2 down

\*  
W. A. EDISON,

Ellis P. R.

Amherst  
Apr 73 1887

Menlo Park, N. J.

Mr. Thomas A. Edison

Dear Sir,

I find every day more and more the necessity of having the diff. sent coils of the magnet of the motor in sight so that we can arrange to put in and cut out resistance.

The drop in speed and power is very plain at the far end of the road and when the clutch is put in at starting. The field loses all its strength. If we had

some simple means  
of putting resistance  
into the Armature  
circuit and taking  
out of the field it will  
just do the business.  
I have tried all these  
things and know that  
it is just what we  
need. The 1.2 ohm  
Armature seems to  
work very strongly

Yours Truly  
Chas. T. Hughes.

709  
T. A. EDISON.

Elie R. R.

Menlo Park, N. J.

April 21 1880

Hughes

My dear Thomas A. Edison  
Dear Sir,

I looked at all the drawings that Mr. Scheffler had done yesterday and gave him the idea for a Reverser the same as we are making here. Mr. Logan says he can make the dynamo for the car here and I think it would be as well to have it done here as we will not have much to do by the time the patterns and castings can be got.

ent. Went over the track  
today but could find  
no joint so bad as to  
make a low resistance  
galvanometer. Since  
taking up same poor  
joints which we found  
on Saturday the drop  
is much lessened and  
motor runs along at  
about the same rate  
all over the road with  
machines in series.  
Are you going to have  
a ~~2nd~~ 1st Armature  
wound for the present  
Locomotive

Yours Truly  
Chas. S. Hughes

Wm. A. EDISON.

Elec. R. R.

Menlo Park, N. J.

Apr 26 1882

Hughes—

Mr. J. A. Edison

Dear Sir,

If you  
want to get a 7.2H  
ohm armature I  
can send the 1H to  
which I have here to  
Dover St. (as it is  
practically useless  
to me with the 19 ohm  
field) or if you will  
tell me how it should  
be wound to get 7.2H  
ohm resistance I  
can do it. <sup>Now</sup>  
I find that the patent  
insulation (containing  
camphor I should say  
from the smell)  
evaporates long before  
the armature gets hot



came out through  
the machine and con-  
denses wherever it strikes  
in lumps. Of course  
this can't do the work.  
It does any good. It  
may do well enough  
for a Generation but  
won't stand the cur-  
rent of several ma-  
chines in the Motor.  
Don't you think it  
would be advisable  
to have an extra  
"3"  
3 amatures on hand  
and if so will you  
have one such.  
Yours Truly  
Chas. P. Hughes

Extrait - from Major J. B. Eaton's letter to  
J. P. A. Edwin May 16<sup>th</sup> 1852

"Mr Shaw will visit you tomorrow  
with some officials from Penn. to see about  
the Electric R. R. ~~between~~ in Fairmount  
Park, Phila. McLaughlin also seems to be  
impatient to have the road out at Cali-  
fornia, but he has talked with you  
much more about it than he has with  
me, so this is no news to you."

(W. J. Hammer Apr 1<sup>st</sup> '98)

THOMAS A. EDISON,  
MENLO PARK, N. J.

24<sup>th</sup> May 1882

Enclosed at letter  
see new form  
of  
your

I am willing to  
travel with your friends  
through you as to my  
Rail road for Switzerland  
as soon as you have a  
strong Syndicate  
Yours truly

3<sup>rd</sup> June 1882 Thomas A. Edison

At the request of  
Mr. Friedman I have  
addressed to Mr. Dapport  
a copy of  
above letter under date  
3<sup>rd</sup> June 1882 it being  
understood that he wishes  
to use Mr. Dapport's name  
instead of doing the business  
himself in order to

facilitate negotiations  
for the formation  
of a syndicate

*S. A. Dixon*

10 20 20 20 40 60 20 20 20 31 14 22 20 20

57.50 Xmas  
pages

20  
\*  
Dixon to  
Bullman  
P. de la...

T. A. EDISON,

Menlo Park, N. J.,

2<sup>nd</sup> June 1882

11

Edward Laporte Esq  
New York

Dear Sir,

I am willing to  
treat with your friends  
through you as to my  
Electric Rail Road for  
Switzerland as soon as  
you have a strong Syndicate  
Yours truly

~~Thomas A Edison~~

W.H. 1898  
Judge of the District Court  
Union Block  
South Avenue Southwest corner 10th Street  
New York, June 1st 1898  
My dear business of some  
two days ago I have the pleasure  
to say in the most important  
judicial case ever before the  
Court of appeals for the second  
circuit of the United States  
methods of structural engineering  
in which case we should bring  
today to a conclusion the matter  
of the case. I hope that you  
will be very much interested in  
the case and accordingly I am  
pleased to say that the matter is  
being handled by

3/18  
can be offered and to  
swallow looking I can control it.  
and of course I could not  
to leave an interest out of  
it and to come in now  
has among being expected  
you had better it is a very matter  
these matters of about them  
good to be. Mr. E. is as busy as  
for other children and I would like  
to see a long talk with you  
about introducing electricity  
and the knowledge of the  
possibility of making a good

this letter to <sup>(2)</sup> advise you that  
Mr. E. is not know  
that it is a thing for Mr. E. to  
brought about the agreement  
between E. and Campbell which is  
no satisfied story to Mr. E.  
And it might alarm  
you to know that  
I have been treated for the  
present.  
I feel that it is the  
of the greatest projects to  
make the electric motor  
better.

(4)  
of Education and the State of the  
the Central Electric  
the various parts of the  
I am personally acquainted  
kind in that way, except  
very to install them in  
electric motive power  
I wish you would  
work with all your energy  
the completion of the  
by the addition of the  
motor or, as I have  
some of the most daring  
men to accomplish the  
for the improvement of  
How could it be  
of the power of the  
over to meet our  
requirements for the  
New York Company of the  
the



THE EDISON COMPANY  
FOR ISOLATED LIGHTING.

GENERAL MANAGER'S OFFICE,  
25 FIFTH AVENUE.

Please address reply  
to the undersigned.

New York,

June 13<sup>th</sup> 1902

Friend Angier,

Let the bracket  
beam for the car have arrived  
at Lund. I wish you would  
give me the thickness and in fact  
a sketch of them. Brill is  
to furnish them and show all  
as they had a pattern for a  
28" wheel. They wrote me the  
beam & shoe would be shipped  
last Saturday. Also send me  
the height of railing on platform  
of car, as I forgot to get that  
dimension when with you yesterday.

Yours Truly

A. J. Sheffer.

# THE WESTERN UNION TELEGRAPH COMPANY.

21,000 OFFICES IN AMERICA. INCORPORATED — CABLE SERVICE TO ALL THE WORLD.

THOS. T. ECKERT, President and General Manager.

Receivable No.

Time Filed

Check

**SEND** the following message subject to the terms on back hereof, which are hereby agreed to.

189

To

Mem. of Agreement dated

June 19, 1882 between

Thomas A. Edison

and Ernst Biederman and Chas. W. Havemeyer

taken out in suit of Siemens-Halske El. Co. of Am.  
vs. Mch. Mch. Mch. Elevated Co. et al.

READ THE NOTICE AND AGREEMENT ON BACK. Sept. 12, 1898.

I have the honor to acknowledge the receipt of your letter of the 10th inst. in relation to the proposed new edition of the "Practical Dictionary" and in reply to inform you that the same has been forwarded to the Committee on Education and Labor of the House of Representatives for their consideration. The Committee has not yet reported thereon, but it is expected that they will do so in the near future. In the meantime, I have the pleasure to inform you that the new edition of the "Practical Dictionary" has been published and is now on sale at the same price as the old edition. It is a very valuable work and is well calculated to be of great service to the public. I have the honor to be, Sir, your obedient servant, J. M. Smith, Secretary of the Board of Education.

both cities approve it.

Assemblyman Shanley  
of Kings, the introducer of the  
bill and its champion has died  
at San Diego, and in order to  
prevent the consummation of the  
Cable Project, advocated to  
President Murphy of the Bridge,  
the use of the electric motor,  
and was asserted, that although  
they estimated the cost of the  
Cable system, at \$200,000, yet  
they would give us an opportunity  
to prove the advantages  
of the electric system.

Mr. Shanley urges my  
friend President Christy to  
advise the Board of Directors, personally,  
and after the appeal before the  
Board, to advise and encourage  
the President to do,  
and to the authority, and at

20  
Some authority from the  
Board of Directors suggest the  
following line of action: to  
appoint a committee at all, at  
present, but first convince  
them that it is the best possible  
system. To accomplish this,  
it would be necessary for me  
to do as Mr. Shanley suggests  
and then invite the Board or  
a committee to examine your  
road at Mendocino and meet you,  
to hear from your own lips, of  
its feasibility and advantages.

If we consider in terms of  
its desirability, the thing, I feel,  
will be your own -

Let me hear from you  
which must be my plan  
and to the authority, and at

[illegible]

J. P. BAILEY, President.  
THEO. THOMAS, Treas. and Gen. Agt.

OFFICE OF

GEORGE THOMAS, Secretary.  
JAS. DAVIS, Superintendant.

The Jersey City Wheel Foundry and Machine Works,



CHILLED AND STEEL-TIRED CAR WHEELS.

P.O. Box 129, Jersey City, N. J., Aug 7 1882

A. S. Edmund Esq.  
Munro Park  
Haverhill, N. H.

Please send us check for  
our acct. amounting to \$900<sup>00</sup>  
as per statement rendered, and  
shape.

Very truly yours  
J. P. Bailey  
Treas.

J. E. BAILEY, President.  
THEO. THOMAS, Treas. and Gen. Agt.

OFFICE OF

Geo. S. THOMAS, Secretary.  
JAS. DAVIES, Superintendant.

The Jersey City Wheel Foundry and Machine Works,



CHILLED AND STEEL-TIRED CAR WHEELS.

P.O. Box 129, Jersey City, N.J., Aug 7<sup>th</sup> 1882

Mr. J. S. Garrison Esq.

Friend  
Dear Sir,

Please send me check for  
our ex. amounting to \$200<sup>00</sup>  
as per statement rendered, and  
ack'd.

Very truly yours  
J. S. Thomas  
Manager.

LONG ISLAND  
RAIL ROAD COMPANY  
VICE PRESIDENT'S OFFICE  
115 BROADWAY  
NEW YORK.

August 25, 1882.

Mr. E. P. Fabbri

My dear Sir:

I have to acknowledge the receipt of your favor of yesterday asking us to place at the disposal of Mr. Edison a piece of track for experimental purposes. I have referred your letter to Mr. Barton the Superintendent, and I have to recommend that you put Mr. Edison's representative in communication with Mr. Barton personally, and if we have what will suit Mr. Edison's purpose, we will do what we can to accommodate him.

Yours truly,

A. Corbin, Jr.

Dear Edison

Answered  
Aug 31/82

Aug 26/82

Mr. Barton sends me word that he thinks he has four miles of road which will suit you & which the L. I. R.R. Co. will gladly place at your disposal. You had better send someone to confer with Mr. Barton at the L. I. R.R. Depot Long Island City - Hunter's Point  
Very truly yrs. E. P. Fabbri



**MONTHLY STATEMENT.**

Jersey City, August 1882

J. Edison Esq.

an account with  
The Jer

The Jersey City Wheel Foundry & Machine Works, Dr.

WONK, COR. GREENE &amp; PEARL.

P. O. BOX 180.

	To Admo. as per Statement	
1 FEB	March	28
March 3	To Admo. as per Invoice	28
9	"	28
14	"	28
April 6	"	4.00
May 30	"	612
June 26	"	161.33
		<u>715.14</u>

Please remit.

JACOB DAVIS  
President & Treasurer

EDMUND J. CLEVELAND,  
Secretary

EW. MURK,  
Superintendent



Elizabeth, N.Y. Aug 28 1882

Mr Thomas A Edison  
Morris Park  
N.Y.

Dear Sir  
Can I see your  
Elect RR in operation  
If I come to Morris Park  
and can I see you the  
same time  
Yours Truly  
H. W. Miller

Answered  
Aug 31 1882

August 31<sup>st</sup> 1882.

Thos Edison

Maule Park N.Y.

"Dear Sir"

Since my visit to New York last Winter I have been watching the paper reports of your success in building the "Electric Motor" for propelling cars - and as I am now compelled by an ordinance of the City Council to do away with steam on my line in part of the City, I would be pleased to find some power that will take its place,

My road is 3. feet - gauge 30 lb T rails laid with cross ties like an ordinary road - My business is largely excursion like the "Coney Island" I have the same kind of cars they have 8 wheels. 34 feet long weighing about 6 tons each - I haul with my steam motor two (2) of them at once - I can haul 3 or 4 - but this is only needed on large excursion.

My road on the portion that I am requiring to substitute a new power on is nearly level with two curves of 90 feet radius -

We have a large water power from which it is possible power could be sent to generate electricity - but steam power could be easily arranged for -

I run cars every 45 minutes through the city - Have you got your machine so perfect that you are prepared to build & equip road of this character -? if so, how soon can you make & put on my road a motor that will do the work? - and what will the motor cost me? Please give me an answer soon as the Council is crowding me on the matter & I want to make them some answer that will cause them to wait on me until I can get some

power that will be a success and you  
are the only inventors that I know  
of that has practically taken hold of  
the matter - & if any succeed  
I think you will  
Very truly yours  
H. W. Perry Rest

WCH

29

Aug 31. 82

McDonough

Referring to your  
letter of 21<sup>st</sup> August  
I am making certain  
economical tests with  
my Electric Rail Road  
(when these are  
finished in about  
six weeks) I shall be  
able to estimate for  
the building of an  
Electric R.R. for you

From

Thos. A. Edison  
Menlo Park N.J.  
Sept-15 1882.

To

Mrs. Turretini  
10 Rue Petitot  
Geneva, Switzerland.

Dear Sir,

I beg to confirm cables as follows. From you  
Aug 30: "Send 500 Lamps & Candles 200 - 16 Candles  
100 - 32 Candles paid Declin"

From you Sept-14: "Concluded arrangements  
build two permanent-Railways from Geneva  
five miles each send all working drawings  
in detail immediately"

The lamps have been ordered and will  
be sent forward as early as possible.

As to Railroad I will write you in  
the course of a mail or so.

Yours truly,

Thos. A. Edison.

See also in same letter Book Pages 345 & 350  
letter to Mrs. Turretini from Thos. A. Edison giving de-  
tails of logging rails, bonding track, circulating  
rails &c

Perhaps you may wish for a copy of these  
the references to bonding are interesting. W. F. H.

(W. F. Hammer  
Mch 30, 1898)

(W. J. Hammer  
Mch 31-98)

Letter Book C - Edison Laboratory, Orange N.J.

Page 134

Sept - 13 - 1882

Mrs Drexel Morgan & Co  
Broad & Wall St -  
New York

Dear Sir

I enclose you herein receipted  
statement of expenditures for August on  
account of English Electric Locomotive

Please place amount of same (\$234.60)  
to my credit & oblige

Yours Truly,

Thos. A. Edison



#### Experiments Made in Pittsburg in April

ing in to Street Care.

The electric railway, known as the "Electric Road," was the first of its kind in the world. It was built by the Electric Road Company, which was organized in 1888. The road was built on a track of rails, and the cars were pulled by electric power. The road was built on a track of rails, and the cars were pulled by electric power. The road was built on a track of rails, and the cars were pulled by electric power.

**A CONTINUOUS CONNECTION**

[illegible]

Ind. Govt. April, 1880

[illegible]

THOMAS A. EDISON ESQ.,

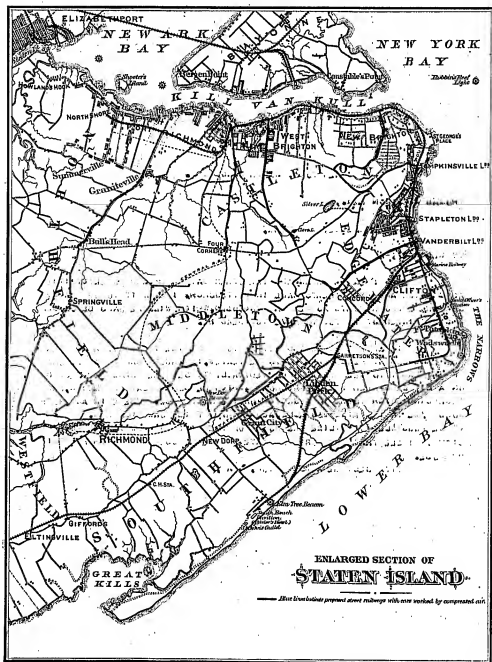
MY DEAR SIR:-

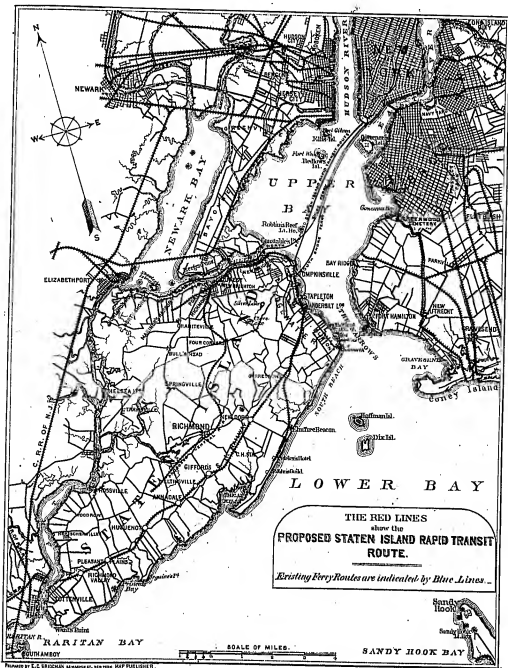
1 I VENTURE TO REMIND YOU OF YOUR PROMISE TO LET ME KNOW WHEN  
2 THE RAILROAD AT MENDO PARK IS TO BE TESTED, IN ORDER THAT I MAY BE ONE  
3 OF THE PARTY TO SEE IT. I HOPE EVENTUALLY TO SEE THE PRINCIPLE TEST IS  
4 ON A LITTLE STATE INLAND RAILROAD WHICH WE CONTEMPLATE BUILDING, AND  
5 AROUND WHICH THERE IS A SKETCH ON THE NEXT PAGE. THERE IS AN INNOVATION  
6 IN THE METHOD, ALTHOUGH THE ROAD WILL RUN ON HIGHWAYS, BUT IT  
7 WILL BE POSSIBLE TO UTILIZE THE POWER OF THE TIDE TO PRODUCE ELECTRICITY  
8 7. I SEE THAT THE FORCE OF WATER IS BEING USED AT MUNICH FOR THIS  
9 PURPOSE.

WITH BEST REGARDS TO YOU, I AM,

TRULY YOURS

*Eustus Winnau*





[From THE NEW YORK TIMES, April 20, 1880.]

## RAPID TRANSIT FOR STATEN ISLAND.

### A PLAN FOR A BELT STREAM RAILWAY TO DISTRIBUTE PASSENGERS.

A movement is being promoted by prominent Staten Islanders to accomplish the three following objects:

1. To lessen the time of communication between New York and all parts of the island by fully 50 per cent.
2. To increase the frequency of trips from once an hour to at least three times an hour.
3. To cheapen, especially in the morning and evening hours, the rates of fare from New York to even the most remote parts of the north and east shores of the island.

The people of this charming suburb of New York have for years patiently borne with the slow, inadequate and expensive ferry facilities furnished them by the Railway Ferry and the North Shore boats, and though both these lines are well managed, and do the best that can be done under the circumstances, the hope of improvement is precluded so long as both lines persist in starting from the same locality, usually at the same moment, running also by side nearly the whole length of the trip, and separating only a mile apart. Six boats, expensively manned, are employed for this purpose, while the cost of two piers in this city, seven or eight docks on Staten Island, and the other attendant outlay, absorbs a great deal more money than there is any necessity for. Nevertheless these heavy expenses, and the infrequency and inadequacy of the communication, so great is the travel that both lines are making large profits, even in furnishing facilities in no respect an improvement upon those which existed twenty years ago.

For many years it has been the universal conviction of residents on Staten Island that the essential step toward procuring more satisfactory communication with this city was to establish a ferry between this city and the point of land on the island nearest it. The distance from the Battery to the foot of Hyatt street, New Brighton, adjoining the Light-house apartment, is a trifle over six miles, which even the existing boats can readily make in twenty minutes. The difficulty has been to provide communication along the East and North shores of the island, to avoid the boats from the expense of doing the omnibus work of delivering the people at the foot of the several avenues. It is toward the solution of this difficulty that the present movement is directed, and it is proposed to do it by constructing a first-class up-and-down railroad along the entire shore of the island, under the bank and mostly on the land between high and low water marks. It is intended to operate the road from the central station at the foot of Hyatt street in both directions, the line running on the north shore to Fort Richmond, and on the east shore the entire length around Fort Wadsworth to South Beach. This latter extension, it is believed, will develop an enormous summer-resort travel, as this beach presents far greater natural advantages than Coney Island, and is still less crowded and less expensive, and for still less cost, especially, will be much preferred by the thousands who elude from the rough landing of the water. To build the road, to equip it, and establish a twenty minute ferry, with the three objects as above stated in view, is the achievement sought to be accomplished by the strong organization of gentlemen who have incorporated themselves under the General Railroad law as the Staten Island Rapid Transit Railroad Company.

[From THE RICHMOND COUNTY GAZETTE, August 16, 1880.]

At present, for a hourly service between New York and Staten Island, by trips that occupy nearly a full hour, the number of passengers carried daily is over Five Thousand. Each of these pays ten cents each way, or twenty cents per day, so that the amount now paid for frequent, slow, and inadequate ferrings by Staten Islanders is \$1,000 per day. The six big boats employed spend more than half their time in distributing passengers up and down the shore of the island, at a cost which precludes the possibility of a reduction of the rate of fare, and certainly makes it an impossibility that there will ever be more frequent or more rapid communication except by a steam railroad as is proposed.

The Rapid Transit scheme contemplates the concentration of the ferry traffic at a point of the island nearest the city, say at the foot of Hyatt street, between Tompkinsville and New Brighton. A line of three boats running between that point and the city can make the trip every twenty minutes, and in about twenty minutes time. Five hundred dollars out of the \$1,000 now daily paid would, it is believed, amply compensate these boats for this service. The remaining \$500, if the firm are kept up to their present figures, would be devoted to compensating the railway for distributing the passengers along the shore in connection with the twenty-minute trips of the boats; the result of which would be that passengers would be distributed more frequently, more rapidly, and much nearer their homes than at present. A traffic of \$200 per day secured to a road which would cost only \$250,000 to construct, and which could be operated for \$200 per day, would yield equivalent to fourteen per cent. per annum on the capital invested. This, too, from a business already existing, and not taking into account the increase which would certainly result from increased facilities.

This, of course, contemplates the centering of the traffic at one point and its control by one organization. It is believed that an intense frequency and rapidity of communication, on opposite projects would have but little chance of success. That the interests of both the existing lines would seem to be in a combination with the new movement, is evident from the fact that proposals for an arrangement between them are already favorably entertained. The new railroad enterprise would certainly have the advantage over all competition, not only by its frequency and rapidity, but by the economy with which it could be run.

[From THE STATEN ISLAND SENTINEL.]

Inasmuch as the line of the proposed Rapid Transit Railroad runs mainly along the bank of the bay and river, between high and low water mark, it becomes important to know what advantages are conferred upon the project by the law of the land. The following extract from *McLellan's General Railroad Law* will, therefore be read with interest:

**PUBLIC LANDS.**—The navigable rivers of this State, and arms of the sea, belong to the people thereof, and the riparian owner has no private property either in the waters of such rivers or in the beds of land between high and low water marks. Such beds of land below high water mark may therefore be taken for a public use, without making compensation to the riparian owner, even though communication between his land and the river is thereby cut off (*Smith v. Hudson River R. Co.*, 8 N. Y. 242; *affirmed* 4 N. Y. 348; *10 Barb.* (1845); *S. P. Stevens v. Putnam*, 11 N. Y. 343; *J. L. 622*; *Leggett v. Chicago R. R.*, 34 Iowa 249; 34 Iowa 105).

[ENCLOSURE]

The Mercantile Agency  
R. G. Dunn & Co.



Pittsburgh, Sep 19 1882

My dear Mr. Vassar

I have just had a talk with  
McKerrem of the Wayne Iron Works & Citizens  
Street Rwy. Co. about the Finney motor -

He says the Clipping attached is very correct and  
that the Experiment was quite satisfactory in  
proving the correctness of the principle notwithstanding  
that the mechanical appliances were crude &  
both time & labor & money will be required to  
perfect them - At present the promoters (who  
appear to be chiefly Dr. Finney the inventor,  
Bedwell & Hen Patent-hangers & himself) are

resting until their patents are awarded &  
defined. Finney's invention is electricity  
applied from a conductor (suspended above  
the cars & is covered by patent dated '76

In 1881 Dr. Siemens of Germany filed  
his patent for an Electric trolleyway in  
which the motive power is transmitted  
through the rails. Hence there is at  
present a conflict of patents which  
must be arranged before the project  
can be made a vigorous push.

[ENCLOSURE]

*The Mercantile Agency,  
R. G. Dunn & Co.*

1000 North 10th.



*Pittsburgh,*

*Pa.*

Mr Brown, who is the practical man  
says it is a bigger thing than the "Westinghouse  
air brake" which is the highest praise a  
Pittsburgher knows for an invention.

Wakewell & Kew are the best Patent attys  
here & Kew has said to his friends that  
the motor is a "branger".

The invention is certainly in good  
hands and their faith in it speaks  
well for its quality. I will keep  
you advised of its progress.

Yours truly

*A. W. Wiley*

same room Sept 199  
H. J. Hamner  
Edgar Allan Poe (C) George Labovitz  
Sept-27<sup>th</sup> 82  
314 Broadway City

M. J. Hamner  
Dear Sir.

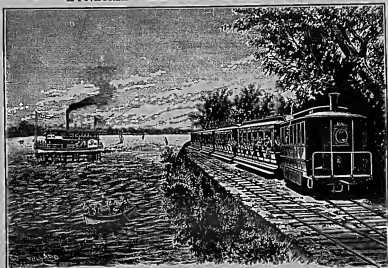
I duly received your favor of the 22<sup>nd</sup> inst. with enclosure named. The system of railroad referred to by your Pittsburg correspondent is nothing more than that of Siemens at present being used in Europe. My railroad at New York will be ready to be tested in the course of a few weeks, I will advise you later as to the probable date of the test - it will afford me great pleasure to have you present at the time. We shall doubtless be able to arrange to put an electric locomotive on your proposed Staten Island Railroad, but I think it would be too expensive to take advantage of the tide such as you suggest.

(M. J. Hamner March 31-94)

J. A. Edison



LYNDALE RAILWAY AND STEAMBOAT.



LAKE CALHOUN.

October 5<sup>th</sup> 1892.

Attn: Mr. Carson  
10<sup>th</sup> St. N.  
St. Paul, Minn.

Islands Park St. J.

"My Dear Sir"

Three years ago I commenced to build a RR here to connect our City with the Lakes within 20 miles of here. I built through this city 2 miles by contract with the City Council that they could move steam when they thought the public good demanded it. This Condition has given our enemies a chance to petition the Council to prohibit steam and while I have for fear held on to steam I find they are still howling & annoying me. I cannot use 'any other power' to do my work in the City - and I shall be pleased to find that power that can do my work with the same economy as steam. In your last letter you say that you will be ready to make estimates on equipping my road in six weeks - I trust your system will result in producing such results as will warrant every road in the country to use it. If I can get a power that I can run for 2 or 4 1/2 miles - I will be in a good

hope to send our counsel to grass.

I shall be much pleased to hear from you as your protecta tests proceed; and just as soon as you are ready, to show a perfect machine I will come & look it over;

I have been watching "Business" of Burlin - for a long time and he is so far off no one can tell from the paper reports just what he has; or what he is doing - you are nearby and we can see what you are at;

I am pleased to hear that your division of light has so succeeded as to make your light machine for street use - this is a wonderful step in advance of your competitors, which is unbelieveing people are ready to register in your favor -

Please let me know how you are progressing and much oblige

Yours Truly  
Wm. C. Brown Treat  
tell him will let him no when we have finished our tests

W. J. H.

20.

COMMISSIONERS OF FAIRMOUNT PARK,

CITY HALL *Thayer*

SUPERINTENDENT'S OFFICE.

*Philadelphia, Feb. 10 1882.*

My dear Sir:

I should like  
to bring Hon. Geo. W. Boker  
President Phila Rapid  
Transit Co to  
Meado to look at  
the Railway and from  
then to go on to  
New York to inspect  
the Light works etc -  
Is the Railway in  
operation daily - and  
when would it quit

You to have us  
come on here would  
not the 18<sup>th</sup> do.?  
Yours very truly  
Russell Thayer.

Thos & Edwin Eng.  
Munlo R.R.

Am making report  
in the maintenance  
of the track of the  
Electro R.R. on  
the completion of  
which I will make  
an app't with you for  
the broken to set R.R. I expect  
to well be in about two weeks.

W. J. H.  
May 1896

Santiago, Chile,  
Oct. 27, 1892.

Prof. Thomas A. Edison

Dear Sir: - In Chile  
we have very many silver and  
copper mines that are so situated  
that drainage by ordinary meth-  
ods is difficult and expensive. I  
am in constant receipt of in-  
quiries regarding the use of electro-  
motors for this purpose. These  
mines usually have plenty of  
steam or water power available  
so that the 3" dynamos can  
in most cases be used for  
driving the motor. We need a  
compact motor of from 2 to 5  
horse power (mounted on wheels  
in some cases) that can be used  
to drive a pump. If you can  
give us such a machine at an  
early date I can sell many.  
In respect to my conversation  
with you while in New York  
regarding electric railways, I am  
taking great pains to ascertain  
what can be done in the  
future. The rainless and water-

(2)

less regions north of here are  
peculiarly suited for such roads  
and I judge that in time the  
expensive and cumbersome steam  
machinery can be supplanted by  
your system. While many new  
winning roads are sure to be  
built. Bearing in mind your  
promise regarding this business, I  
am ready to guarantee the  
organization of a strong company  
to carry on this business which  
ever you are ready to furnish  
me with the necessary data  
and conditions, and to furnish  
at any time capital sufficient  
to lay an experimental road  
to demonstrate the system, all  
of which at your earliest con-  
venience.

Our work is rapidly progressing  
and we shall give light in 7  
days from date.

I remain,  
Yours Truly,  
Wm. Stewart.  
GHS



(Letter Book, © George Thompson)

Page 345 of 349

Oct-27-1882

Letter of J. A. Edison to Thomas A. Swan

"We are sending you by Wells Fargo & Co Express and the Patent Office drawings relating to Electric Railroads together with working drawings of Passenger Locomotive, Electric car & the turn table. The drawings of the spanning-iron are now under way and follow in a few days."

(Then follows detailed explanation of method of insulating track, bonding same, testing insulating etc.) W. J. Hammer April 1-88



New York, October 30th. 1882.

65 Fifth Avenue.

William M. Ridgway, Esq.

Boston, Mass.

Dear Sir:-

I have been so very busy all the week that I have found it impossible to write you as promised before this. The article in Scribner you refer to was written at the time when Mr. Edison was first commencing his experiments on electric lighting. The statements made in it are in the main correct but it refers to lines of experimenting which Mr. Edison to a great extent forsook in order to give his undivided attention to the development of his system of electric illumination. His Phonograph now is in practically the same condition that it was at the time the article was written. He has experimented on it but very little since and it is to day what it was at that time mechanically and scientifically very wonderful and yet so simple but of little or no practical value commercially. Doubtless at some future period when Mr. Edison has more time on hand he will take it up and apply it to some practical purpose but at present there does not seem to be much prospect of his being able to do so. The same remarks apply to the Acrophone and to the Megaphone. As to the Microphone, that is simply another form of his carbon telephone just now extensively used all over the world. Mr. Edison has of late years given but little attention to telegraphic matters and I hardly think there is anything new which you could

make use of in your paper. In fact his whole time has been devoted to the perfection of his electric light inventions. You ask what are the difficulties in the way of the general adoption of electricity as an illuminant in houses and state that you infer that the only difficulty is the expense of the original plant. As a matter of fact Mr. Edison has put his system of electric lighting into general use at the present time. The only difficulty just now in the way of its rapid adoption is the limit to construct and erect the necessary machinery and apparatus for providing the light. The question of its cost has long been settled. Upwards of two and a half years ago Mr. Edison proved that scientifically it was possible to subdivide the electric current for the general purposes of illumination and at the present time he is putting that scientific proof to the test of practical experience by running his light side by side with gas, and selling it to consumers on electric motors at the same price at which gas is now being sold in New York. I think if you study the bulletins which I send you and also look carefully into Mr. Lunprew's article on Gas and Electric Illumination in a recent number of the Popular Scientific Monthly you will be able to get a very clear idea of what Mr. Edison has done in connection with electric lighting. The district which we are now lighting up is bordered by Wall, Nassau and Spruce streets and the East River. We have at the present time about 2500 lamps of 16 candle power each connected up with our system and we are connecting others up daily. When

we have the full complement of lights burning which will be in the course of the next few months we shall have between 14 and 10000 lights on the system. From this you will see that Mr. Edison and his co-workers look upon the problem as absolutely solved and as soon as we get everything in full running order we shall invite experts to make the necessary tests to prove that we can produce light by means of electricity cheaper than by means of gas.

In addition to giving light in this district we shall also supply electrical power. Electric meters will be connected with electric mains in precisely the same way as we connect our lamps and by means of these meters we propose to run all kinds of small machinery up to 5 or 10 H. P. We can operate a fan or a sewing machine an elevator or a dumb waiter a printing press; in fact all kinds of small machinery. We shall not go beyond the 5 or 10 H. P. as there is far more money to be made in the supply of small power electrically. The reason for this is that the small steam engine is very uneconomical and requires a very consumption of coal as compared with small engines giving greater H. P.

RR  
In addition to the electric light, Mr. Edison has on hand at the present time a series of experiments in connection with electrical locomotion. He has an experimental track of upwards of two and a half miles long and three foot gauge at Manhattan Park. On this we are running a passenger locomotive which will attain a speed of upwards of 50 miles, drawing a coach containing

about 40 people. We have also a freight locomotive capable of drawing 10 cars each carrying four tons of freight at the rate of 10 or 12 miles an hour and we are just now finishing a car which will run by itself having the commutator that works it underneath the car. This car will carry about 30 people at 15 miles an hour at an expense of about two and one half to three

U. P. The method by which this road is operated is as follows: We have a central station in which are our electric generators, steam engines for running same and boilers. The electric current is conveyed from this central station to the track, the two rails of which act as conductors of the current. The wheels of the locomotive take up the current from the rails and convey it to the motor of which the locomotive is composed. This motor is connected with the driving wheels by means of belts. We are expecting to obtain considerably better results from this electric locomotive than can be obtained from a steam locomotive, the reasons for which are that with the steam locomotive there is a heavy consumption of expensive coal whereas with the electrical locomotive the coal consumption is about half and the price of coal is about half what it is with a steam locomotive. This is in consequence of our using a stationary steam engine as against the locomotive steam engine. As against this we suffer a certain loss by the conversion of steam power into electricity and the reconversion of electricity into power but notwithstanding this our economy over that of the steam locomotive is still very considerable. At the present time we are building an electric loco-

motive which have about the same capacity as the ordinary Hudson River Railroad steam locomotive. When this has been tested it is proposed to send it to England for the purpose of exploiting the electric railroad there.

I think that if you propose writing a series of articles  
 it would be far better for you to pay a visit to New York. If  
 you could give me say a day or two I would arrange to take you  
 through all our shops here and show you exactly what we are doing  
 in electric lighting and also go to Menlo Park and show you our  
 electric railroad. I would also introduce you to Mr. Edison and  
 you could have a talk with him and in a few minutes know far more  
 from him personally than I could possibly write about in a long  
 series of letters. In the present state of electrical science  
 the rapid advancements that have been made within the last year  
 or two and the probable advancements that will be made within  
 the next few years, are subjects which would form the basis of  
 a series of very interesting articles for your paper. Of course  
 anything that I can do for you in the matter I shall be most happy  
 to. If you require any electro types I can I think supply you  
 with them as we have a considerable stock of them referring to  
 Mr. Edison's electric light. There are so many details in con-  
 nection with the system that if you were here personally you could  
 look into and get an understanding of in a very short time. I  
 send you back by this mail the copy of Scribner which you so kindly  
 sent me, and remain  
 Very truly yours,

Frank

New York, October 30th. 1892.

65 Fifth Avenue.

My Dear Batchelor:-

Your favor of the 16th. inst. came duly to hand. With reference to Fabbri's option on European stock, I do not know whether he will take it or not. It will greatly depend I think on the market price of the stock. The terms of the option are as follows: Edison is to give Fabbri notice that he considers the first station in successful operation and Fabbri is to have the right to take the European stock at par within three months of that date. Now, Edison has not yet given Fabbri that notice. He has been waiting to get two or three dynamos running together. This he has successfully done experimentally, and we shall have them running next week with the lamps on and as soon as they have been going 3 or 4 days I propose suggesting to Edison the necessity of at once giving Fabbri the necessary notice. It is my personal impression that Fabbri will exercise this option and take the stock. I have not got any definite grounds for this idea except that Winslow, Lanier & Co. who are interested with Mr. Fabbri in the syndicate which took the first block of stock busied themselves considerably about European Light Co. affairs when Bailey was here. I rather fancy that Drexel, Morgan & Co. will endeavor to get the control of the European Co. when they see that the first district is going to be a success. Bailey has some ideas as to this matter as they had frequent conversations with him on the subject. You might sound him about

it but do not tell him that I have given you this information as I promised him I would say nothing whatever about it. However, as Edison is my original source of information and not Bailey I have a perfect right to tell you what I know about it as long as I know that Edison is willing that I should.

Borgmann & Co. are in full occupation of their new establishment and it is running splendidly. It is undoubtedly one of the most elegant factories in New York. They started moving two weeks ago yesterday (Saturday) and on the Thursday following had all their men at work again in the new place. They are preparing to double up their capacity in most departments and if your people propose ordering much from them I think you will be served far more promptly than heretofore. They are going to make money undoubtedly and I think your 10 per cent interest on Edison's one third share will bring you in dollars at least during the first year of the partnership.

Coerc street is pretty hard pressed just now. We have about 100 to 150,000 dollars worth of stuff on hand and if you can send us some orders for L<sub>1</sub> Z, or C dynamos you will be doing us a very great favor. The Lamp Factory is going along pretty well. They are not making money on their lamps but I do not think they are losing any now. I have got Mr. Lowrey to agree to a clause in the new contract providing that the Lamp Company shall have 40 cents for every lamp and we are to settle the details of the contract one day early next week. When it is all settled,

signed and delivered I shall send you a copy for your information.

Menlo Park is looking terribly desolate. Everything except the Brown engine and boiler and dynamo machines necessary to run the railroad is being brought in. Library and office affairs are all cleared out and the whole contents of the laboratory from floor to attic are being sent in to, Bergmann & Co. Bergmann & Co. are to buy the machinery from the machine shop at Menlo Park and are going to do Edison's experimenting for him, his laboratory being on the top floor of their building. I think this is about the last of Menlo Park. I am sorry for your owners of real estate there. Of course, the railroad experiments will still be continued out at Menlo. But this cannot last more than six months or at most a year. Did I write and tell you that we have got out a model and are now completing a locomotive for England which will be the size of an ordinary Penn. steam locomotive? It will be built on exactly the same plans as an English locomotive and to look at the model that is what you would think it is.

Johnson has been elected Vice President of the Light Company Eaton being President. Of course, Eaton's functions will be about the same as they have been heretofore. It gives Johnson an official standing and I suppose he will take about as much interest in the business as he has been doing since he returned home. This is looking after things in general in Edison's behalf, criticizing work and suggesting improvements whenever necessary.

Edison's Model is now at George Labaree's 117 H. Avenue



4  
We all think this a very good move. Johnson went in as the nominee of Mr. Edison and Grexol, Morgan & Co.

The Isolated Company still continues to thrive. I think that on the first of December they will declare a dividend of 10 per cent. They are getting orders every day and their plants give entire satisfaction. The first district is still running with one dynamo. Edison has got that rigging for the coupling device all fixed up and all last week the boys were practising throwing in and out machines. He promises to put on over a thousand more lights tomorrow or Tuesday and another thousand will follow very soon after. From the figures I do not think it will be more than a month before instead of the first station being a drag on the resources of the Illuminating Co. it will be a source of income to them. Of course not very much at first but they will come all right after. It will be a great thing to be able to make some money three months after the first station is started.

ENGLISH AFFAIRS. English light is getting into a most fightful pickle. We have had some very sharp correspondence indeed with the English Co. In fact about the sharpest business correspondence that I ever had anything to do with. It has ended by Mr. Arnold White starting for America with the object of trying to smooth things over. The trouble is though that A. White is not capable of running an electric light company. I told Johnson this at the time of his appointment. Johnson admitted the truth of it and said that A. White was to be Secretary and not business

manager. Unfortunately he is also the latter and still more unfortunately old Mr. Bouverie thinks White is capable of filling the position. But from private information Johnson gets from London it would appear to us that the whole business is being hurried. Do you hear anything on this subject?

SWITZERLAND. We hear that the Societe Electrique has appointed agents in Switzerland and proposes to do business there. We learned of this from Bailey when he was over here, and stated that Edison had made an agreement long before the French companies were formed giving the right to use his name in Switzerland. The action of the French companies reflects discredit upon Edison as it gives Lourretine the impression that we are investigating this movement from here. Now this is not so and Edison feels very much displeased about the matter. Bailey promised to put it right. Would you mind seeing that he does?

With kind regards to Mrs Batchelor, believe me,

Very sincerely yours,

RECEIVED  
OCT 30 1882  
ANSWERED

Mr. J. M. Edman  
Dear Sir,

Oct. 31, 1882  
FILE NO. 20

From an experiment I tried with the Passenger Locomotive I think that the new winding is no improvement on the old way. I pushed the ten freight cars and the Passenger Car as far as Dark Lake  $1\frac{1}{4}$  miles from the Central Station and would go no farther.

The grade is against us all the way for the last half mile mentioned. On returning succeeded in getting within about half a mile of the Station and stopped while on the grade. Think that considering the unimproved condition of the track that the old winding would have done pretty well.

Took the freight engine out and pushed Passenger engine. Passenger Car and ten freight cars over all the grades from the extreme

end with ease with no noticeable difference in speed between the extreme end and the station or with or without load.

The field magnets get very warm. The armature but slightly so. The resist-

-ance of the magnets are of ohms and of the armature .56 of an ohm and running with 270 volts the field gets altogether too much current.

With the three coils in series the resistance would be 60 ohms.

How would it do to connect the two top fields in series and multiple are them and the lower field separately.

The Passenger Engine works first rate and I think you may safely send people to see it at any time.

Yours Respy  
Chas. F. Hughes

HCH

20

Oct 30 1882

HCH

The enclosed is a copy of the  
report of the committee on the  
subject of the proposed  
amendment to the constitution  
of the State of New York  
which was adopted by the  
Legislature at its session  
in 1881. The report is  
submitted to you for your  
information and for the  
purpose of enabling you to  
make such use of it as you  
may think proper.

THOMAS A. EDISON,  
MENLO PARK, N. J.

Nov 28<sup>th</sup> 1882.

Mr Saml Inell.

Dear Sir, You can fetch  
your people out at any time  
you see fit as we made the  
test I spoke of and have an  
Armature all right. I don't suppose  
there will be any body here on Thurs-  
day unless it is. Especially  
desirable in which case of course  
I can have the Engineer stay. If  
you let me know in time you  
want a load of coal today and it  
will be necessary to have another  
to keep going until the coal ord-  
ers get you arrived. Telegraph me  
if there is any likelihood of any-  
body coming on Thursday day.  
I shall get the result of the short  
test we made.

Yours Truly  
Chas. L. Hughes

W.J.H.  
May 5, 1892.

Santiago, Chile,  
Dec. 1, 1892.

Mrs. A. Edison, Esq.

Dear Sir: I hope you  
will not forget my letter of  
three weeks ago regarding the  
electric railway. The indications  
now are that a large company  
will be formed here to control  
the use of electricity in this  
country in every form, by the  
purchase of all valuable patents.  
They will do business in your  
lamps, are lamps, telephones,  
machines, railways, etc.

If you will give me your best  
terms for the railroad patents as  
promised in effect, I can soon  
make a dollar or two for you  
disposition.

Yours Truly,  
Wm. Stewart.

May 5  
Whatshall  
1892

May 11 1895  
G. W. Stewart

RECEIVED  
APR 7 1882

J. B. BRILL & CO.,  
CAR BUILDERS.

ANSWERED

St. J. G. L. Esq. Philadelphia, April 6<sup>th</sup> 1882  
65 Fifth Ave. New York

Dear Sir,

We will furnish you one car body  
of size shown in your drawing. Inside  
finished in varnished wood. Sash & blinds,  
seats and backs of perforated wood.  
Solid larraps, wrought iron gates. Flat  
boards heavier with 1/2 inch yellow pine  
flooring on platforms, Car primed two  
coats putted and one coat color  
Inside work varnished up to last coat.  
Price, del'd on car at our works \$900.  
If full details are given immediately we  
will undertake to complete it in four  
weeks.

Any framing different or additional  
to our usual style will be put in at  
cost extra.

Yours Truly,  
J. B. Brill & Co.



THOMAS A. EDISON,  
MENLO PARK, N. J.

Nov 28<sup>th</sup> 1882

Mr. Thomas Edison  
Dear Sir,

We started at 9<sup>00</sup> this a.m. with the Passenger Engine and Car and made four round trips equal to 24 miles when the atmosphere got quite warm and we took the freight engine with two loaded cars equal to 12 tons to Pumphawan and back 4 miles.

Stopped running at 11<sup>20</sup> a.m. leaving the fire in better condition than when we started as the Engineer expected us to run longer than we did, and now keeping his fire up accordingly. We burned 416 lbs of Anthracite Coal.

Traveled the track circuit and ran with the field of the Machine in until 12<sup>00</sup> P.M. and leaving the fire in the same condition as when we began at 11<sup>20</sup> found that we had burned in the last two hours 216 lbs of the same kind of coal. The main belt

is very loose and flaps so as to touch the floor at times.

The Engine takes steam before passing the Centre which would account for some loss in the Engine. The first trip with the Passenger Engine was made with the track well covered with snow.

Yours Truly  
Chas. T. Hughes

THOMAS A. EDISON,  
MENLO PARK, N. J.

Dec 1<sup>st</sup> 1882

29  
#124  
Hughes

Samuel Merrill.

W. S. Gardner

I ran the freight  
Engine through seven inches  
of snow on the rail over all  
the grades until the graded stretch  
which was running in the snow  
got so filled up that it could  
not move and we had to give it  
up. Am fixing an arrangement to  
keep the snow away from the  
stretch and we can run all right.  
We have not heard any thing from  
the coal you ordered and the only  
thing to do is to get it from New  
York. Shall I do it?

The Engineer  
says it takes between 500 and 600  
lbs of coal a day to heat the Lab-  
oratory and the house.

Mr Edison  
spoke about heating the Laboratory  
with stoves. It will take at least

those large stoves to heat the Laboratory, up stairs and down and then the gas house will freeze up, and so long as a man is kept the saving in coal would not amount to much, and there is not and has not been a stove in the place in years. I guess I can safely say that whenever you wish to bring anybody to see the road you can do so unless we have a foot or more of snow.

Yours Truly  
Chas. F. Hughes

P.S. As I am liable to have to come to the city as often this month as last I have bought a communication ticket.

H.

Sic 547. 1887.

Ran freight engine and one  
loaded car weighing six tons.  
Three hours from 1 P.M. until  
4<sup>35</sup> P.M. making seventeen miles  
and found that after running  
three hours and leaving the coal  
in the furnace and water in  
the boiler the same as when  
we started we had burned  
474 lbs of coal and evaporated  
4286 " of water.  
Temperature of the atmosphere  
41° above zero

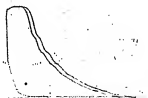
Yours Truly  
Chas. F. Hughes



[ATTACHMENT]

1st Field in  
2nd Track "

Rev 65  
" 64  
Stream 65



Front end  
H.O. Spring

C13

1st Field in  
2nd "Track"

Rev 65  
" Rev 64  
Stream 65



Front end  
H.O. Spring

C14

Track in

Rev 66  
Stream 65  
Front end  
H.O. Spring



C15

*airily for  
here 11-12*

THE STATEN ISLAND  
RAPID TRANSIT RAILROAD COMPANY.

Incorporated April, 1885.

DIRECTORS:

PRESIDENT—ERASTUS WIMAN, of Messrs. H. G. Bush & Co., 314 & 315 Broadway, New York.  
VICE-PRESIDENTS—W. W. MACFARLAND, Counselor-at-Law, 61 Wall Street.  
TREASURER—J. FRANK EMMONS, of Messrs. H. L. Horton & Co., Bankers, 46 Broadway.  
A. HEDGECOCK, President United States Rolling Stock Company, 35 Broadway.  
FRED. THOMAS, of Messrs. White, Martin & Co., Bankers, 3 Wall Street.  
E. MORTON, of E. Morton & Co., Bankers & Commission, 51 Exchange Place.  
JOHN D. VANDERBILT, President New York Central & Hudson River R.R. Co., 655 Broadway.  
TH. H. WHITTAKER, of Wallcutters & Co., Bankers, 37 Exchange Place.  
ADOLPH L. KING, of the Old Dominion Steamship Company, Pier 37, N. Y.  
W. H. PENNINGTON, New Brighton, N. Y.  
WM. KIRBY, of Messrs. Seligman & Ilgenstein, 63 Wall Street.  
GEORGE BACHTER, Bank of Superintendents, Brooklyn, N. Y.  
J. H. MARTIN, of Messrs. Seligman, Baskin & Martin, 171 Broadway.  
THEODORE E. LARSEN, SECRETARY, 18 WALL STREET, NEW YORK.

NEW YORK, DECEMBER 14TH 1885.

THOMAS A. EDISON ESQ.,

65 FIFTH AVENUE, NEW YORK,

MY DEAR SIR:—

I AM VERY MUCH OBLIGED TO YOU INDEED FOR YOUR KIND NOTE ADVISING ME THAT ON MONDAY NEXT I CAN BE PERMITTED TO SEE AN EXHIBITION OF THE ELECTRIC RAILWAY AT MENLO PARK. I SHALL TAKE THE LIBERTY OF BRINGING WITH ME A SCOTCH GENTLEMAN REPRESENTING LARGE INVESTORS AND HOUSES IN GLASGOW; ALSO MR. MACMILLAN, PRESIDENT OF THE IRON STEAMBOAT COMPANY, AND PERHAPS ANOTHER FRIEND OR TWO.

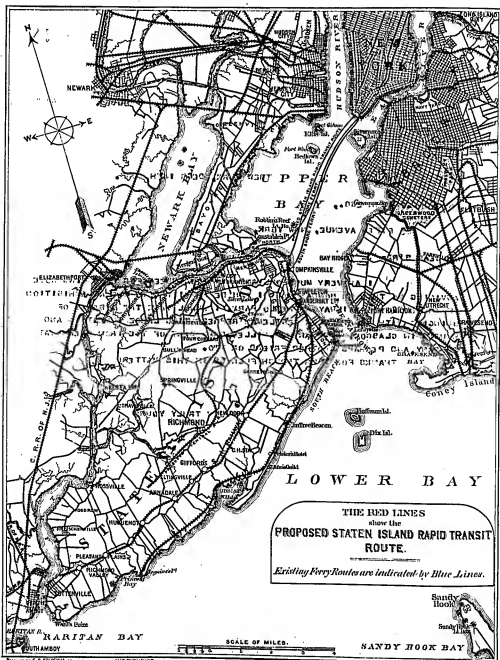
THANKS FOR YOUR THOUGHTFULNESS IN THIS MATTER

VERY TRULY YOURS

*Erastus Wiman*

*Referring to your letter of  
14<sup>th</sup> inst what time do you  
propose to go to Menlo Park  
on Monday next. we might  
arrange to go down on the same  
train*





# RAPID TRANSIT FOR STATEN ISLAND.

## A PLAN FOR A BELT STEAM RAILWAY TO DISTRIBUTE PASSENGERS.

A movement is being promoted by prominent Staten Islanders to accomplish the three following objects:

1. To lessen the time of communication between New York and all parts of the Island by fully 50 per cent.
2. To increase the frequency of trips from once an hour to at least three times an hour.
3. To cheapen, especially in the morning and evening hours, the rates of fare from New York to even the most remote parts of the north and east shores of the Island.

The people of this charming suburb of New York have for years patiently borne with the slow, inadequate and expensive ferry facilities furnished them by the Railway Ferry and the North Shore boats; and though both these lines are well managed, and do the best that can be done under the circumstances, the hope of improvement is precluded so long as both lines persist in starting from the same locality, finally at the same moment, running side by side nearly the whole length of the trip, and separating only when they reach the Island, to deliver passengers by the slowest and most expensive process along its shores at eight landings barely a mile apart. Six boats, expensively manned, are employed for this purpose, while the cost of two piers in this city, seven or eight docks on Staten Island, and the attendant outlay, absorbs a great deal more money than there is any necessity for. Notwithstanding these heavy expenses, and the infrequency and inadequacy of the communication, so great is the travel that both lines are making large profits, even in furnishing facilities to no respect an improvement upon those which existed twenty years ago.

For many years it has been the universal conviction of residents on Staten Island that the essential step toward procuring more satisfactory communication with this city was to establish a ferry between this city and the point of land on the Island nearest it. The distance from the Battery to the foot of Hyatt street, New Brighton, adjoining the Light-house department, is a trifle over six miles, which even the existing boats can readily make in twenty minutes. The difficulty has been to provide communication along the East and North Shores of the Island, to save the boats from the expense of doing the omnibus work of delivering the people at the foot of the several avenues. It is toward the solution of this difficulty that the present movement is directed, and it is proposed to do it by constructing a first-class steam railroad along the entire shore of the Island, under the bank and mostly on the land between high and low water mark. It is intended to operate the road from the central station at the foot of Hyatt street in both directions, the line running on the north shore to Port Richmond, and on the east shore the entire length around Fort Wadsworth to South Beach. This latter extension, it is believed, will develop an enormous summer-resort travel, as this beach possesses far greater natural advantages than Coney Island, can be made more accessible, and for still salt-water bathing especially, will be much preferred by the thousands who shrink from the rough liffing of the surf. To build the road, to equip it, and establish a twenty minute ferry, with the three objects as above stated in view, is the achievement sought to be accomplished by the strong organization of gentlemen who have incorporated themselves under the General Railroad law as the Staten Island Rapid Transit Railroad Company.

[FROM THE RICHMOND COUNTY GAZETTE, August 14, 1880.]

At present, for a hourly service between New York and Staten Island, by trips that occupy nearly a full hour, the number of passengers carried daily is over Five Thousand. Each of these pays ten cents each way, or twenty cents per day, so that the amount now paid for infrequent, slow, and inadequate service by Staten Islanders is \$1,000 per day. The six big boats employed spend more than half their time in distributing passengers up and down the shore of the Island, at a cost which precludes the possibility of a reduction of the rate of fare, and certainly makes it impossible that there will ever be more frequent or more rapid communication except by a steam railroad as is proposed.

The Rapid Transit scheme contemplates the concentration of the ferry traffic at a point of the Island nearest the city, say at the foot of Hyatt street, between Thompsonville and New Brighton. A line of three boats running between that point and the city can make the trip every twenty minutes, and in about twenty minutes time. Five hundred dollars out of the \$1,000 now daily paid would, it is believed, amply compensate three boats for this service. The remaining \$500, if the fares are kept up to their present figure, would be devoted to compensating the railway for distributing the passengers along the shore in connection with the twenty-minute trips of the boats; the result of which would be that passengers would be distributed more frequently, more rapidly, and much nearer to their homes than at present. A traffic of \$200 per day secured to a road which would cost only \$50,000 to construct, and which could be operated for \$200 per day, would yield equivalent to fourteen per cent. per annum on the capital invested. This, too, from a business already existing, and not taking into account the increase which would certainly result from increased facilities.

This, of course, contemplates the concentrating of the traffic at one point and its control by one organization. It is believed that as against frequency and rapidity of communication, competing projects would have but little chance of success. That the interests of both the existing lines would seem to be in a combination with the new movement, is evident from the fact that proposals for an arrangement between them are already favorably entertained. The new railroad enterprise would certainly have the advantage over all competition, not only by its frequency and rapidity, but by the economy with which it could be run.

[FROM THE STATEN ISLAND SENTINEL.]

Inasmuch as the line of the proposed Rapid Transit Railroad runs mainly along the bank of the bay and river, between high and low water mark, it becomes important to know what advantages are conferred upon the project by the low level of the land. The following extract from *McMaster's General Railroad Law* will, therefore, be read with interest:

**PUBLIC LANDS.**—The navigable rivers of this State, and arms of the sea, belong to the people thereof; and the riparian owner has no private property either in the waters of such rivers or in the strip of land between high and low water mark. Such strip of land below high water mark may therefore be taken for a public use, without making compensation to the riparian owner, even though communication between his land and the river is thereby cut off (Gould v. Hudson River R. Co., 6 N. Y. 525; Williams v. C. 12 Barb. 619); S. P. Stevens v. Totten R. R., 24 N. J. L. 525; Ingraham v. Chicago R. R., 34 Iowa 289; 32 Iowa 106.



(Page 588 Letter Book "A" Edison Laboratory)

Extract from letter to Chas. H. Hammer Esq  
4-78+79 Wall St New York.

Dear Sir,

"In our agreement of 19<sup>th</sup> June '82  
it is provided that I shall send to Geneva  
as soon as convenient - a skilled  
workman from my laboratory understand-  
ing the device used in connection  
with my Electric Railway System to give  
necessary instructions to workmen in  
Geneva &c &c &c.

Made at Orange N. J. by  
(Chas. H. Hammer)  
Feb. 20 - 1898

Signed J. A. Edison -

(Put this at the end of the 1882 papers.  
Mr. Hammer was to get the date of  
the original letter, but it does not  
appear here.)

See my letter to him dated Apr. 20/98.

BENJAMIN FLAGLER, PRESIDENT.  
ALB. CHURCH, VICE-PRESIDENT.

ARTHUR SCHOELLKOPF, TREASURER.  
BENJAMIN RHODES, SECRETARY AND ENGINEER.

W. J. R.  
May 15/83  
Answer to Mr. Flagler  
96  
Niagara Falls and Suspension Bridge Railway Co.

Niagara Falls, N. Y., June 22 1883.

Edison Electric Railway Co. -

Sir:-

Some months since through the  
courtesy of Mr. Edison, I witnessed a trial trip  
of the Edison Railway at Kew-Forest. Being well  
adapted to build a street railway in the immediate  
vicinity of cheap water power I am interested  
to know whether the Edison motor is yet on the  
market. For several years information as to  
terms &c. will be gladly received.

Very truly yours

Benjamin Rhodes

Long St

W. J. R.  
5 May

Minneapolis, Lyndale & Minnetonka Railway Co.

W. M. McGRATH, President,  
H. S. JONES, Secretary, Agent,  
S. E. JONES, Treasurer.

MINNEAPOLIS, LYNDAL & LAKE GARDEN RAILWAY CO.  
MINNEAPOLIS & LAKE TANE RAILWAY CO.  
THE LYNDAL RAILWAY CO. *Consolidated.*

Minneapolis, Minn., Jan 30<sup>th</sup> 1883

W. J. L.  
May 5-18

Thos A. Edison

New York City

Write what we are

doing

"Dear Sir"

Not hearing from you for sometime

I have come to the conclusion that possibly through  
press of business you had overlooked our work  
I am still on the anxious seat about a new power  
for our city travel; I got our city council last fall  
to make an estimate - because there was nothing  
invented that would do the work but steam - they  
estimated our time until April 1st next which  
is only two months distant - If you have not  
fully perfected your machine so you would be  
satisfied to send it out to do work. I wish  
you would write me such a letter as will  
show our City Council that I have done all  
in my power to get a new power to do the work  
& have not as yet succeeded. - By doing so you  
will personally oblige

Yours Truly

W. J. L. Pres.

W.D. 1896	
Dept of Electric Railroad	
Feb. 1, 1883	
To Feb. 1st 1883.	
Road Road	1612 03
Restles	480 13
Insulation	3234 67
Electric Passenger Car	2186 20
Material	4169 28
Right of Way	1002 19
Cable Car	753 83
Track	3083 49
Electric Connections	816 81
Engine House	217 17
Turn Table	205 90
Rolling Stock	10287 07
Separating	2116 46
Central Station	3113 92
Experimental	1338 67
Lundry	1298 17
Furnace	210 04
New Motor	6533 65
Total	37729 $\frac{68}{100}$ 37129 68

THOMAS A. EDISON,  
NO. 65 FIFTH AVENUE.

20

NEW YORK

Angier

Feb 28<sup>th</sup> 1893

Mr. J. A. Edinger

San Jose

and looked the ground  
over for the proposed  
R.R. cut between. The

only really feasible  
route is the reader  
ground. of a new  
street which would  
make it necessary  
to cross two streets at  
grade. West Chester Park  
and Huntington Ave.  
The first would have  
a street railroad but  
don't appear to be much  
used and Huntington  
Avenue at the point  
at which we would  
cross is hardly used  
at all and leads to



to nowhere, in particular  
beyond the Fair building.  
I told Mr. Weston (the  
city) that we can  
arrange to cut out  
the tracks electrically  
so that our system  
would be no more ob-  
jectable than any ordinary  
street railway. To cross  
the streets by means  
of trestles would make  
it necessary to build  
almost the entire  
road on trestles and  
would be more expensive  
than the Association  
would care to stand  
but of course it can  
be done. They talk about  
making preparations

THOMAS A. EDISON,  
No. 65 FIFTH AVENUE.

(3)

NEW YORK

188

to draw 400 or 500  
passengers at a time  
but I think you can  
show them that acc.  
ommodations for  
250 or 300 will do. you

can fix the Freight  
Engine very easily  
to put an "L" machine  
by allowing one pair  
of Pulleys to overhang.  
The Passenger Engine  
is too light to carry  
an "L"

The new motor  
started 30 days today  
when the 18" belt showed  
signs of coming apart  
and we had to cement  
it and leave it until  
morning. I think I can keep

the driving wheels on  
the track so that we  
can haul everything  
we have at this end  
of the road but to  
make it a grand suc-  
cess larger wheels will  
be necessary as the  
pull of the belt is  
almost directly up-  
ward and the diam-  
eter of the wheel and  
pulley are so near  
alike that the tenden-  
cy is to lift the wheels  
clear of the track. We  
now about all have  
today and the engine  
and the dynamo  
we are cool we have  
able when we got  
through James Chas.

W. J. H.  
March 16, 1883

Room 35  
No. 2 Wall St.

New York Mar. 16, 1883

My dear Sir:

I should like to  
take hold of the executive part  
of your Electric Railway interest  
to introduce by building one  
at some good point.

I can probably come to you  
well endorsed for such a  
connection -

Hoping to hear from you  
Yours truly,  
Charles H. Hurde

Mr Thomas A. Edison -

W. J. H.  
May 15-1898

Royce Hotel all 1/18/98

My dear Sir

I hear nothing from  
you as to going Sprague - I suppose  
he comes at an unfortunate time  
When Everything is in a transition  
stage - but that need not be  
regretted any more than it could be  
anticipate - His resignation has  
been accepted - and he is now  
here waiting for me to tell him  
what I want him to do - If I had  
the English matter adjusted & I  
could take the Bull by the Horns  
I should put him to work very  
quick - but I haven't - and as  
to resign in the U.S. Navy doesn't  
have enough surplus pocket  
money to allow him to loaf  
long - beside he is not one who  
can endure it long - He is very  
Anxious to get to work - He has  
telling me a few days ago about  
some excellent ideas he has in  
re to Electric Motion - Railway -  
He was asking me to advise him  
in the matter - The Idea then  
took possession of me - that he  
is of all men the very one to  
take charge of your Railway  
Experiments. He understands the  
matter theoretically & practically  
& would fill that position  
I am sure to your entire

Satisfaction - It certainly needs  
some one to take it in hand for  
you - The Underground Line  
from Channing Cross to Chelsea  
is now incorporated & Siemens  
will do the work in the absence  
of Competition You should put  
some life into this thing  
& there is the chance to do it in  
a thorough manner -

Sprague has had good offers from  
Out side parties one of \$20000  
- but will not go into anything  
except Edison - besides as you  
know it is through my influence  
& promise he left the service -  
Now is my other protege planning  
Out? (Benton) - All the good  
men want come to us - We must  
pick them up when we see  
them - & I have picked this  
man Sprague out of the US Navy  
Whether he or I must be satis-  
fied upon - Please see to it before  
our delay offends & makes  
us appear unwilling

Yours Truly

Edw. A. Johnson

If I had the money I would  
keep him here on my own &  
until I could use him - but  
I haven't - It's had to help someone  
of my old boys kicked out by White &

Johnson  
20 June 85

Subject

-: Electric traction.:-

**EDISON ELECTRIC LIGHT,**

NEW 222 BROADWAY ST.

RECEIVED

*San Francisco* April 19 1883. 1883

*In reply to yours*

*No*

Sam'l Insull, Esq.,

65 Fifth Avenue,  
New York.

Dear Sir:-

Our mechanician has invented an apparently feasible device for magnetizing rails so as to increase the traction of the locomotive, and wants me to take it up with him. His patent lawyer reports no American patents on the subject and the inventor knows of none except Werdemann's of London, and that is entirely different. I am certain, however, that I have heard Mr. Edison claim increased traction for his electric locomotive and think he must have such a claim among his patents. Will you kindly advise me of the facts and explain his device and claim, or refer me to his patent if issued? I don't want to spend any money on a thing already covered, but if it is a clear field I may do so - and in that case will lay it before Mr. Edison. Pardon me for troubling you, but I know he is very busy and that you are good natured.

With kind regards, Truly Yours,

*Geo. S. Smith*

W.J.H.  
May 5-98

Mr Edison has several devices for increasing traction to be used in connection with the electric railroad.

- (1) Heavy electro magnets mounted on locomotion and adapted to be connected in circuit when desired.

(This has not yet been patented & should therefore not be made public.)

- (2) Creepers grasping the rails and driving or pushing the locomotive.

(Pat. No. 225,778 dated Oct. 10, 1897)

- (3) Varying the weight of two or more cars of the train to give traction by placing a motor on each car.

(Pat. No. 273,490. Mar. 6, 1893.)

There are devices included in applications and patents. Mr Edison might, however, have tried others, or contemplated the use of other devices of which he may have sketches and descriptions.



WJH  
Mar 5-1898

20

Certificate of

Incorporation

of the  
Electric Railway Co.  
of the  
United States.

Dated April 28<sup>th</sup> 1883.

STATE OF NEW YORK :  
: ss:  
City and County of New York. :

W E, Egisto P. Fabbri, Grosvenor P. Lowrey, Sherburne  
B. Eaton, Thomas A. Edison, Simeon G. Reed,

That we desire to form and do hereby form a Company  
pursuant to the provisions of an Act, entitled "An Act to author-  
ize the formation of Corporations for Manufacturing, Mining, Me-  
chanical or Chemical purposes", passed February 17th. 1948 and of  
the several acts extending and amending the said Act.

That the Corporate name of the said Company is to be  
Electric Railway Company of the United States.

That the objects for which the said Company is to be  
formed are the acquisition, development, use and disposition of  
devices, inventions, improvements, caveats, applications for  
patents, patents, grants, concessions or privileges for electrical  
propulsion or the use of electrical apparatus on Railways or appli-  
cable in any way to the use of electricity or electrical apparatus  
in any form for constructing, equipping, operating or maintaining  
Railways, or for Railway appliances; the manufacture, use and  
sale of machines and appliances in connection with the purposes  
above set forth, and the sale and license to sell and use all such

inventions, caveats, applications for patents, patents, grants, concessions or privileges.

That the amount of the Capital Stock of the said Company is to be Two Million Dollars.

That the term of the existence of the said Company is to be fifty years.

That the number of shares of which the said Stock is to consist is to be Twenty thousand shares, at One Hundred Dollars a share,

That the number of Trustees who shall manage the concerns of the said Company is to be nine, and the names of such Trustees for the first year are

Henry Villard, of New York City,  
 Egisto P. Fabbri, of New York City,  
 Grosvenor P. Lowrey, of New York City,  
 Sherburne B. Eaton, of New York City,  
 Simeon G. Reed, of Portland, Oregon,  
 Stephen D. Field, of New York City,  
 Robert E. Deyo, of New York City,  
 Charles W. Rogers, of New York City, and

That the operations of the said Company shall be carried on in the United States of America and the Dominion of Canada and

the principal office of the Company shall be in the City of New York, County and State of New York:

IN WITNESS WHEREOF, we have hereunto set our hands this Twentieth day of April, One thousand eight hundred and eighty three, (1883).

E. P. F.

G. P. L.

(Signed).

S. B. E.

T. A. E.

Simeon G. Reed.

Stephen D. Field.

R. E. Deyo.

C. W. Rogers.

Ms. A. 9.8 20  
New 5-98

Agreement  
between  
Stephen D. Field et al  
and  
Thomas A. Edison et al

in re:  
N. Y. City Company  
April 20<sup>th</sup> 1883.

MEMORANDUM of an AGREEMENT between  
Stephen D. Field and Simeon G. Reed, on behalf of themselves and  
associates, of the First part, and Thomas A. Edison and S. B. Eaton  
on behalf of themselves and their associates, (including the  
Edison Electric Light Co.), of the Second part.

WHEREAS, Mr. Field and Mr. Edison have each been  
engaged in experiments and inventions having for their object  
electrical propulsion on Railways and have each obtained Patents  
and applied for other Patents, and it has been proposed to unite  
the two interests, and

WHEREAS, Agreements have been entered into between  
the parties hereto of even date herewith, for the formation of  
another Company uniting all of the interests excepting the rights  
to use upon elevated railroads in the City of New York, and

WHEREAS, it is proposed to unite the two inter-  
ests for use upon elevated railroads in the City of New York

It is, therefore AGREED as follows:

I. A CORPORATION, under the laws of the  
State of New York, shall be formed within six months from the  
execution of this Agreement, to which shall be transferred all  
the inventions now owned or controlled by the parties hereto,  
being exclusively applicable to electrical propulsion on Railways,  
but not including lighting and heating by electricity, to be used  
only upon the Elevated Railroads in the City of New York now ex-  
isting, or that may hereafter be extended from the present Elevated  
Roads, or independently built.

in Exhibit 1212<sub>2</sub>

All future inventions of the said Edison made prior to January 12th. 1886, and all future inventions of said Field made at any time hereafter which may be exclusively applicable to electrical propulsion on Railways (but not including lighting and heating by electricity) shall also be transferred to, the said Corporation for use upon the said Elevated Railroads. And the said Corporation shall also receive exclusive licenses to use on the said Elevated Railroads all <sup>inventions</sup> inventions which have been made or may be made by the said Edison before January 12th. 1886, and which have been made or may at any time be made by the said Field, incidental to such propulsion, exclusive of lighting and heating by electricity.

The stock of the said Corporation shall be used for the purchase of the rights or license to use upon the said Elevated Railroads, and shall be divided as follows:

(A) Sufficient thereof shall be sold to pay into the Treasury of the parent Company above referred to, a sum equal to the proportion that the Capital of the two Corporations bears to the Capital of this Corporation in the amount paid by the parent Company to the said Field and Edison, to reimburse them for their cash outlay in experiments, or in other words, this Corporation shall contribute pro rata, with the Capital of the Companies towards such reimbursement.

(B) And after such reimbursement the remaining stock shall be divided: fifty per cent (50%) to the parties of the First part, and fifty per cent (50%) to the parties of the Second part.

The Stock to be divided between the Field and Edison Interest, shall be deposited with a Banking Company, and placed under the charge of a Special Committee of three, one named by the Field interest, one by the Edison interest, and a third to be named by these two; and none of the said stock shall be sold, pledged or used, except under the direction of this Special Committee. This Committee shall give to each owner of the stock a receipt specifying the number of his shares, and whenever he wishes to sell the same or any part thereof, he shall give notice to the Committee and they shall sell it and give him the proceeds if the price to be obtained be such as they think it right to take, having regard to the interests concerned, but not below the price at which he may limit it. When either interest desires to sell, the other shall be notified, and shall be at liberty to contribute one half or less of the amount to be sold at the same time and price, and the proceeds shall be divided pro rata.

At such time as the Field and Edison interest may dissolve the Committee, which must be within two years of the date hereof, the stock not sold and belonging to each owner shall be returned to him.

It is further agreed, that should the parties hereto, consent to forego the formation of a Corporation as herein provided a sale to the Elevated Railroad Companies of the rights to use the Patents and inventions may be made outright, and the proceeds apply as the stock of a Company is to be applied.



IN WITNESS WHEREOF the parties hereto  
have hereunto set their hands and seals this Twentieth day of  
April, 1903.

Signed, Sealed and De-  
livered in the presence of

as to S. D. Field and  
S. G. Reed. (Signed)

Edw. P. Howell

Chas. Edgar Mills.

Stephen D. Field.

Simeon G. Reed.

T. A. E.

S. B. E.

E. E. L. Co. by

S. B. E. Pt.

as to T. A. Edison and

S. B. Eaton and S. B. Eaton Pt.

The Edison Electric Light Company  
65 Fifth Avenue

J. E. Edison Pres  
E. N. Johnson Vice Pres  
E. P. Fisher Treas  
C. DeWolf Secy

New York April 23rd, 1888

T. A. Edison, Esq.,  
City.

Dear Sir :-

Enclosed please find copies of three papers to be considered at a meeting of the Executive Company of the Light Company to be called tomorrow. The papers are (1) Certificate of Incorporation of Electric Railway Company of the United States, (2) Agreement between Field, Edison and others regarding the General Company; (3) Agreement between Field, Edison and others regarding the New York company.

Regarding the Certificate of Incorporation, I am not quite satisfied with having our interest supply four of the names of the incorporators. I will state my reasons at the meeting tomorrow.

Regarding the agreement for the General Company, it suits me pretty well. I have spent a good deal of time on it, and have required Mr. David Dudley Field to redraw the contract several times, in order to get it to suit me. So far as I am concerned, I am quite well satisfied with it as it now stands.

Regarding the agreement for the New York City Company, I am also satisfied with that.

It will be necessary for our Company to designate the four Directors who will represent it in the Board of Direction of

the General Company. As to the New York city company, we must decide whether we shall insist upon naming half the Board, and if so who they shall be.

Will you kindly look over these agreements so as to be prepared to vote upon them when the meeting shall be called tomorrow.

Very truly yours,

S. B. Eaton

President.

Per Mc.G.

ELECTRIC RAILWAY CO OF THE UNITED STATES.

R. H. NEED, PRESIDENT.  
C. M. HODGINS, VICE PRESIDENT.  
F. HAN. DIXON, SECRETY & TREASR.

Mills Building,  
New York City, June 6th 1883

Thomas A. Edison Esq.  
65 Fifth Ave.  
City.

Dear Sir,

Replying to your favor of 23d. ult. recd. on  
my return from the meet. I beg to say that  
Mr. S. D. Fied does not expect to commence work  
at Menlo, until the return of his assistant Mr.  
Frank B. Roe, from Chicago, which may be delayed  
until end of this month. It is therefore unjust  
to longer keep Mr. Hughes and the Engineer waiting,  
and would be well for you to avail of Mr. Hughes  
services as suggested by you. Excuse the  
delay, which has been unavoidable.

Very truly Yours

R. H. Need

ELECTRIC RAILWAY CO OF THE UNITED STATES.

S. G. REED, PRESIDENT  
C. M. JOHNSON, VICE PRESIDENT  
CHAS. DIMON, SECY & TREASR.

*Mills Building,  
New York City, June 6, 1883*

Thomas A. Edison, Esq.,  
65 Fifth Ave.

City.

Dear Sir:-

I am this morning in receipt of the following night messages which will doubtless interest you.

Chicago, June 5, 1883.

"Ran car empty at one P. M. Could have carried passengers but desired carry Commissioners first. Made them pay fare to-night. Mr. Adams starting train. Everything all right."

(Signed) Frank B. Roe.

(Company's Electrician in charge.)

Also,

Chicago, June 5, 1883.

"We made satisfactory paying trips to-night.

"Road in entire order. Shall commence regular running tomorrow."

(Signed) J. McGregor Adams.

(Comm'r & Treasurer of Nat. Exposition Railway Appliances.)

Comment is unnecessary.

I also beg to hand you copy of the Chicago "Inter-Ocean" containing an article on the Electric R'way; and also enclose herewith a pass thereon, which please accept with the compliments of the Commissioners.

Very truly yours,

  
V. P.

W-744  
Aug 5-1883

ELECTRIC RAILWAY CO OF THE UNITED STATES,

Mills Building,

New York City, August 30<sup>th</sup> 1883.

R.O. REED, PRESIDENT,  
S.W. HOODS, VICE PRESIDENT,  
S.H.B. DIMON, SECRETARY & TREASURER.

Samuel Insull Esq.,  
Care of A. G. Edison Esq.,  
65 Fifth Ave., City.

Dear Sir;

Your letter of the 28<sup>th</sup> duly received. I have made all necessary arrangements with Mr. Van Cleave, Swanson and Clarkson, and will have the road running for the inspection of our friends on Monday.

I beg to hand you herein your duplicate of your letter to me which you kindly loaned me, and thanking you for your attention, I remain,

Very truly yours,

*Chas. Rogers* N.Y.

W.S.H.  
July 5-1898

Answer say  
 Will give you letter  
 Thomas Barndick  
 soon. New York, Nov 7 1883  
 Yours W. A. Dixon

My dear Sir  
You  
are doubtless aware that  
I am investigating electric  
rail-way &c. with view  
to negotiation with you & com-  
pany. It will facilitate our  
to have will briefly give  
but your best opinion as  
to the best methods of op-  
erating electric power to cars.  
In the line of practical experi-  
ence my thoughts are often  
on  
Yours Truly, James Rogers



MR. EDISON'S ELECTRIC RAILWAY  
INVENTIONS IN EUROPE.

Opinion of Mr. Eaton as to who is entitled to past and future Inventions, prepared June 11th, 1890.

I.

GREAT BRITAIN AND IRELAND.

(1) The first disposition made by Mr. Edison of his electric light and power inventions in Great Britain and Ireland, was his agreement of December 31, 1878, with Messrs. Drexel, Morgan & Co. and Messrs. Fabbri and Lowrey. That agreement disposed of certain of his inventions and patents relating to electricity for the "uses of illumination, power and heating", and will be fully discussed in this opinion.

(Note:- A list of all the contracts and other documents relating to this subject, so far as I know, is annexed at the end of this opinion, arranged chronologically).

(2) For how long a period was Mr. Edison bound by the above agreement to turn over his said inventions? My answer is that the agreement of December 31, 1878, together with the supplemental instrument of December 31, 1881, bound him as follows:

(a) To turn over to Messrs. Fabbri and Lowrey, Trustees, all inventions and improvements made during five years, i.e. prior to January 1, 1884. (See Sec. 3 of said agreement).

(b) To constitute Drexel, Morgan & Co., his attorneys in fact, to convey to all purchasers of inventions covered by the aforesaid five year period, "a like interest" in all future inventions as aforesaid, made between the end of the said five year period and the end of seventeen years from December 31, 1878, the date of the said agreement, i.e. December 31, 1895. (See Sec. 7.)

(3) What disposition did the said Trustees, Messrs. Fabbri and Lowrey, and the said attorneys in fact, Messrs. Drexel, Morgan & Co., make of the said patents and inventions?

They entered, jointly with Mr. Edison, into the Bouverie agreement of February 18, 1882, for the formation

of the English Company. Under that agreement the said English Company acquired the following patents and inventions of Mr. Edison:

(a) All patents already taken out by him or in his behalf in relation to the application of electricity or magnetism as a lighting, heating and motive agent. (See Sec. 8 of Bouverie agreement.)

(b) All extensions of the said patents, without further payment. (See Sec. 9.)

(c) All improvements made by Edison "upon or connected with the said inventions so far as said extensions and improvements may relate to the application of electricity or magnetism as lighting, heating and motive agent." (See Sec. 9.)

(d) The Bouverie agreement further provides that after making "any such improvements", and after taking out patents for them, Mr. Edison shall "with all reasonable speed" inform the said English Company thereof, and of the expense both of his experiments and of obtaining patents, and the Company shall then have three months to elect whether to acquire "the improvements referred to in such notice." If they do not elect to take, their rights cease. If they do elect to take, they shall pay to Mr. Edison his aforesaid expenses in experiments, with 100 per cent. added, without reference to his compensation from other sources, and shall also pay him the amount of all expenses and fees in obtaining and keeping up such letters patent.

(e) Clearly this Bouverie agreement covered electric railway inventions (See (5) below). Moreover, it covered all of Mr. Edison's said "improvements" made at any time in the future, without limit. In this last regard, this agreement binds him longer than the aforesaid Drexel-Morgan agreement of December 31, 1878, which bound him only for seventeen years, i.e. to December 31, 1895.

(Note. It should be observed that as regards the future, Mr. Edison agreed to turn over his "improvements". The question arises whether this includes all sorts of new inventions relating to lighting, heating and motive agent. A variety of words seem to have been used when speaking of improvements or inventions. For instance, words in the said Drexel-Morgan agreement are "studies and experiments for making other inventions" (See first recital, p. 1.); also "any invention relating to the general subject matter". (See Sec. 1); also "inventions or improvements" (See Sec. 3); also "inventions" (See Sec. 7); whereas the word in the Bouverie agreement is always "improvements"; also "inventions, improvements, devices and letters patent contemplated" (See Power of Attorney of March 1, 1881, to D. M. & Co.). Were all these words in-

tended to be used synonymously ? I think they were.)

(4) Did the English Company acquire by the Bouverie agreement everything which Messrs. Drexel, Morgan & Co. et al. had acquired by their agreement of December 31, 1878; and have the last named parties any existing rights to-day under their said agreement?

What Drexel, Morgan & Co. acquired, is mentioned herein in section (2) above. It was, first, the Edison inventions and improvements for illumination, power and heating, made prior to January 1, 1884, and, second, the right to give to other parties, i.e., for instance, the said English Company, "a like interest" in all similar future Edison inventions till January 1, 1896. I have no doubt that as regards the said first item, i.e. inventions made prior to January 1, 1884, the English Company acquired them. As regards the second item, i.e. the said "like interest", my opinion is that it was superseded and virtually annulled, except as stated below in Sec. (5), by the Bouverie agreement. That agreement, I should mention, was duly "ratified and adopted" by the English Company, as appears by Sec. 99. of its Articles of Association.

(5) Have Messrs. Drexel, Morgan & Co. any existing rights to-day under their agreement of December 31, 1878? In my judgment they have not, except as to electric railways, as stated below in the next section hereof.

(6) What rights, if any, have Messrs. Drexel, Morgan & Co. and associates, to-day, as to Mr. Edison's railway inventions? In reply I submit the following as my opinion:

(a) Inasmuch as the Bouverie agreement included electric railways, i.e. every electric "motive agent", there is no doubt, as already stated, that the English Company was entitled to past and all future inventions, pursuant to its privilege of election mentioned above in (d) of Sec. (3).

(b) But Sec. 15 of the Bouverie agreement has this important provision, to wit, that as regards all patents which the English Company elect to take, as aforesaid, they shall grant to Mr. Edison, or his nominees, free and exclusive licenses to use the same and "any improvements thereof" for "locomotion only on railways, or tramways or on common roads". This license was in fact afterwards granted, namely, the indenture of November 15, 1883, between the English Company, Mr. Edison and Messrs. Tabriz and Lowrey, the last two named parties being designated therein as the said "nominees."

(c) The important question now arises, for whose benefit did these nominees take title under the aforesaid license, to the electric railway inventions? Was it to Mr. Edison alone, or for the

parties jointly interested in the Drexel-Morgan agreement of December 31, 1878, or for whom? Who are the beneficiaries under the trust assumed by Messrs. Fabbri and Lowrey, the two "nominees" as addressed? I cannot answer this question with certainty, but I shall discuss it below.

(d) To begin, I am surprised not to find any declaration by Messrs. Fabbri and Lowrey, nominees, declaring for whose benefit they took the aforesaid free and exclusive licenses for locomotion. Mr. Edison has no copy of any such declaration, nor has Mr. Coster, and I am told that probably none was ever made. If such a document exists it would probably solve this question. But not being able to find any, I must draw my own conclusions from the documents before me.

(e) As regards all electric railway inventions and improvements made by Mr. Edison prior to January 1, 1884, the same being covered by the agreement of December 31, 1878, it seems to me that it must have been intended that the aforesaid licenses to Fabbri and Lowrey, nominees, from the English Company, were for the benefit of the parties to that agreement, just as if electric railway rights had never been parted with by those parties. Doubtless the plan was when the Bouverie agreement was made and the English Company was about to be formed, to give to that Company all the uses of the various patents and inventions save and except the uses for locomotion purposes. One way to carry out this plan, as regards patents usable for both locomotion and lighting, was for Messrs. Fabbri and Lowrey, Trustees under the Drexel-Morgan agreement, to retain title to the patents but to grant licenses thereunder to the English Company for the uses and purposes contemplated. Another way was to assign the patents to the English Company, and to then take back from them free and exclusive licenses for locomotion. Naturally this last way was adopted, and Messrs. Fabbri and Lowrey who had parted with title for all uses in their capacity as trustees, received back a restricted title for locomotion purposes only in their capacity as nominees. I must assume there was some good reason other than an intended change of interests, why these gentlemen were called Trustees in the one case and Nominees in the other. However, that is a trifling matter. Whatever they are called, it seems to me that the intention must have been that Messrs. Fabbri and Lowrey should take the licenses for locomotion purposes with the same force and effect as if the uses of patents for those purposes had never passed away from them. I am,

therefore, of the opinion that Messrs. Drexel, Morgan & Co. and associates, have the same interest in Mr. Edison's electric railway inventions made prior to January 1, 1884, as if Messrs. Fabbri and Lowrey, Trustees under the original agreement, had never ceased to hold title to said inventions.

(f) Assuming then that Messrs. Drexel, Morgan & Company and associates have the interest mentioned above, can Mr. Edison fairly claim that it has been forfeited for anything which they have either done or omitted to do?

All grounds of forfeiture are set forth in the said agreement of December 31, 1878. The second section thereof provides that if Drexel, Morgan & Company fail to dispose of "the principal or controlling invention", that is to say the certain application for a British patent filed at London on or about the day of October, 1878, before July 1, 1882 (extended by the agreement of March 1, 1881, to January 1, 1886), Mr. Edison may require his patents to be reconveyed to him. This ground of forfeiture or reconveyance, however, was defeated by the Bouverie agreement of February, 1882, which did in fact dispose of the said controlling invention.

The third section of the said agreement of December 31, 1878, provides that if Drexel, Morgan & Company fail or refuse to advance the sums requisite to obtain Letters Patent, Mr. Edison may by written notice served on them, require his patents to be reconveyed to himself. Evidently, this relates only to inventions made prior to January 1, 1884. If Drexel, Morgan & Company have failed or refused to advance the said sums, and if Mr. Edison has given the said notice, it seems to me that the electric railway patents now in question covering inventions made prior to January 1, 1884, should fairly be reconveyed to Mr. Edison, as regards the specific patents in question in each case. Whether in fact, there was a default of this kind, I do not know, but I assume there was not.

(g) It may be said that under a reasonable construction of the second section of the said agreement of December 31, 1878, Messrs. Drexel, Morgan & Company and Messrs. Fabbri and Lowrey, Trustees or nominees, should now consent to turn over to Mr. Edison all electric railway license's secured from the English Company, together with all rights so far as electric railway inventions are concerned touching all inventions made by Mr. Edison prior to and since January 1, 1884, because Messrs. Drexel, Morgan & Company have not yet made any disposition of the said inventions so far as electric railways are concerned, and have not contributed to the expense of experiments and patents. Have they

not, therefore, fairly forfeited their rights by inaction ?

In answering this question, we must remember that under the Bouvaris agreement the parties to be dealt with by Mr. Edison touching expenses for experiments and patents, were the English Company, and not Messrs. Drexel, Morgan & Company. If Mr. Edison has asked the English Company to pay these expenses, and if they have refused to do so, it may fairly be asked what were his duties to Drexel, Morgan & Company under those circumstances ? Unfortunately, I find nothing in any of the agreements providing for this emergency. Indeed, I would not undertake to foretell what the decision of a Court would be on this and kindred points if this matter were to end in a lawsuit. In my mind, it presents a question for amicable adjustment between the parties.

(h) Suppose Mr. Edison were now to make some new inventions applicable to electric railways, who would own them, in view of the opinions I have expressed ?

I think that if these inventions were covered by the Bouvaris agreement recited above in section (4) of this opinion, they would go to the English Company in the first instance, if that company elected to pay for the experiments and patents, and that the said company would be obliged to grant an exclusive license, under the license agreement of November 15, 1883, mentioned above, to Messrs. Fabbri and Lowrey as nominees.

But suppose the English Company elected not to pay for the experiments and patents, who then would own these inventions for Great Britain ? This is a difficult question to answer, but having studied all these agreements carefully, and having tried to discover the real intent lying behind them, I think that these new inventions of Mr. Edison for electric railways, would in the foregoing emergency belong to Messrs. Fabbri and Lowrey, as nominees, so far as Great Britain is concerned, the same to be held by them for the benefit of the respective parties to the fundamental Drexel-Morgan agreement of December 31, 1878.

It may be asked, would Messrs. Fabbri and Lowrey pay the expenses of experiments and patents as to these new inventions ? I find nothing in the agreements which supplies an answer to this question, but it seems to me that the safe course for Mr. Edison to pursue, would be to notify the said nominees and Messrs. Drexel, Morgan & Company, that unless the English Company paid for experiments and patents as required by the Bouvaris agreement, he would expect them to pay for the same, and in default thereof, after giving reasonable notice, he

would treat the said inventions as his own property. If any of the new electric railway inventions now in question are not covered by the Bouverie agreement, that is to say, if the English Company has no claim upon them, I think that even then the proper course for Mr. Edison to pursue is to give reasonable notice to Messrs. Drexel, Morgan & Company and associates, that unless they pay for the experiments and patents, he shall treat them as his own property. True, I find nothing in any agreement which requires Messrs. Drexel, Morgan & Company to pay for the aforesaid experiments, nevertheless it is certainly just that if Mr. Edison puts his time into making the experiments for the benefit of his old associates, they should pay for them, at least to a reasonable extent.

The difficulty in expressing an opinion on these questions, is, that while they are not actually covered by the agreements, they are nevertheless probably covered by what was intended, and by what the parties had in mind when the agreements were made. In such cases I think that the best way is for the parties themselves to get together and come to an amicable adjustment, for I am sure that these questions cannot be answered with certainty by means of the agreements themselves.

To sum up, and to reply more definitely to the question asked above, viz: what rights, if any, have Messrs. Drexel, Morgan & Company and associates, today, touching Mr. Edison's railway inventions as regards Great Britain and Ireland, I reply that with reference to the license granted to Messrs. Fabbri and Lowrey, as Nominees, by the license of November 15, 1883, I think that it should be treated as covered by the Drexel-Morgan agreement of December 31, 1878; and that with reference to subsequent electric railway inventions, as well as to any which Mr. Edison may hereafter make, they also should be considered as covered by the said agreement of December 31, 1878. I further think that the various and important points yet requiring solution, as above stated, should be settled by mutual adjustment and consent by and between the parties to that agreement, in a spirit of fair dealing to all concerned. I regret that I cannot give a more satisfactory reply, but in view of the absence of provisions in the various contracts covering matters now under discussion, this is the best answer I have to make.

II.

SWEDEN AND NORWAY.

(7) Sweden and Norway are covered by a set of agreements dated March 1, 1881, made between Mr. Edison, Messrs. Drexel, Morgan & Company and Messrs. Fabbri and Lowrey, as Trustees. This set of agreements is substantially the same as those referred to above relating to Great Britain and Ireland, viz: the agreement of December 31, 1878, and the set of agreements also of March 1, 1881.

These agreements for Sweden and Norway cover illumination, power and heating, and authorize Messrs. Drexel, Morgan & Company to dispose of all inventions or improvements made by Mr. Edison prior to March 1, 1886, and to grant a like interest in all subsequent inventions made by him for seventeen years, that is to say, prior to March 1, 1898. The proceeds are to be divided equally between Mr. Edison and Messrs. Drexel, Morgan & Company.

My comments made above as regards electric railway inventions in Great Britain and Ireland, apply with like force to this set of agreements for Norway and Sweden, I believe that Messrs. Drexel, Morgan & Company have never parted with any rights of any sort under these agreements, consequently.



LIST of all agreements, &c., which Mr. Eaton is able to find relating to Mr. Edison's Electric Railway Patents and Inventions for Europe, with comments on same, prepared to accompany Mr. Eaton's Opinion of June 11, 1890.

(1) December 31, 1878. This is the date of the fundamental agreement, the parties thereto being Mr. Edison, Messrs. Drexel, Morgan & Company, and Messrs. Fabbri and Lowrey, as Trustees. The agreement covers patents granted by the United Kingdom of Great Britain and Ireland, that is to say, "Great Britain and Ireland, the Channel Islands, the Isle of Man, and such other portions of the British Dominions as are included in such Letters Patent". The subject matter of the patents covered by this agreement are inventions relating to electricity for the "uses of illumination, power and heating". Messrs. Drexel, Morgan & Company agree to pay for the expense of taking out patents, also to pay for any exhibitions they might see fit to make, and to assume the financial management as to disposing of patent rights. The patents were to be transferred to Messrs. Fabbri and Lowrey, as Trustees, subject to the agreement.

The agreement further provides in its second section, that if Messrs. Drexel, Morgan & Company fail to dispose of "the controlling invention" before July 1, 1882, Mr. Edison can within six months thereafter require them to reconvey to him the patents subject to then outstanding licenses or assignments made by them, if any.

(Note:- Apparently the various documents which were to be executed jointly with this agreement of December 31, 1878, that is to say Powers of Attorney and Covenants by Trustees, were not prepared and executed until more than two years after the date of the agreement, viz: March 1, 1881. And I find that in the Trust Agreement of that date, viz: March 1, 1881, from Mr. Edison to Messrs. Fabbri and Lowrey, the following: "and in case Drexel, Morgan & Company shall have failed to dispose of the principal (sic) or controlling invention referred to in the second clause of said agreement of December 31, 1878, before January 1, 1886". Then upon demand in writing by Mr. Edison served on Messrs. Drexel, Morgan & Company within six months after January 1, 1886, the Trustees must reconvey to Mr. Edison all the patents and inventions assigned to them, but subject to outstanding licenses, &c. How this period happened to be changed from July 1, 1882, to January 1, 1886, I do not know, but there is no doubt that

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the change was made and that it became binding on Mr. Edison.)

By this agreement of December 31, 1878, Mr. Edison further agreed to assign to the said Trustees all inventions made prior to January 1, 1884, also to constitute Messrs. Drexel, Morgan & Company his Attorneys in fact to convey to all purchasers of inventions assignable prior to January 1, 1884, as aforesaid "a like interest in all future inventions" after that date.

(Note:- Annexed to this agreement of December 31, 1878, is a list of agreements to be drawn as supplemental to the said agreement itself, and in that list reference is made to the above mentioned Power of Attorney to Messrs. Drexel, Morgan & Company, to wit: "A special power by Edison to Drexel, Morgan & Company to sell all his interest in existing and future inventions of the five year period, and Letters Patent to be granted thereon, and to agree with the purchasers of any invention that they are to have the title to all the like inventions made within seventeen years from date of foregoing agreement, subject, however, as to inventions subsequent to July, 1884, to a compensation to be fixed by arbitrators." I find that such a power was actually given by Mr. Edison to Messrs. Drexel, Morgan & Company under date of March 1, 1881, and that it covers the aforesaid inventions made before January 1, 1884, and "a like title or interest or right" to all further inventions made between January 1, 1884, and the end of seventeen years from December 31, 1878, that is to say, December 31, 1895, the latter being subject to compensation, payable to Mr. Edison, to be fixed either mutually or by arbitration.)

The third section of this agreement of December 31, 1878, provides that if Messrs. Drexel, Morgan & Company "shall fail or refuse to advance the sums requisite to obtain letters patent for any invention, it shall be at the option of Edison, within a time specified in a notice in writing to be served by him upon Drexel, Morgan & Company and each of the Trustees (and which shall not be less than two nor more than three months) to require a reconveyance by the Trustees to him of all right, title and interest remaining in them, x x x and not sold or disposed of or agreed to be, in good faith, by Drexel, Morgan & Company, and after the giving of any such notice the interest of Drexel, Morgan & Company in such invention or the proceeds thereof, shall cease." The said section then goes on to provide that Messrs. Drexel, Morgan & Company may, upon receiving the aforesaid notice, require an arbitration upon the question whether their refusal to make advances was justified, and if the arbitrators decide that it was the said notice by Edison shall be held void. The fourth section provides that no cancellation of interest as aforesaid shall impair any obligations then existing touching

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purchasers or intending purchasers.

The second section of the said agreement of December 31, 1878, gave Mr. Edison the right, as already stated above, to demand a reconveyance to him in case Messrs. Drexel, Morgan & Company failed to dispose of "the principal or controlling invention" within a certain period, which period appears to have been fixed by the supplemental trust agreement of March 1, 1881, already mentioned above, as January 1, 1886. I assume that this provision is of no effect, because Messrs. Drexel, Morgan & Company did in fact dispose of the said invention when they made the agreement of February 18, 1882, known as the "Bouvier Agreement", pursuant to which there was subsequently formed the company known as "The Edison Electric Light Company, Limited".

(2) March 29, 1879. I find a letter of this date from Mr. Lowrey to Messrs. Drexel, Morgan & Company. In it he refers to a letter from Mr. Edison to himself promising an interest to Mr. Lowrey in all of Edison's English patents. I have no copy of that letter from Mr. Edison to Mr. Lowrey. This letter of March 29, goes on to say that the proceeds or profits of English patents, are to be divided equally between Mr. Edison and Messrs. Drexel, Morgan & Company, and that the interest thus secured to Messrs. Drexel, Morgan & Company shall belong two-thirds to them and one-third to Mr. Lowrey. All communications made to London or Paris Bankers are to be chargeable against the Drexel, Morgan & Company interest alone, but all other charges are to be charged against them and Mr. Lowrey jointly. The letter further states that the same understanding exists as to any other foreign patents concerning which similar arrangements may be made between Mr. Edison and Messrs. Drexel, Morgan & Company. The letter concludes by asking Messrs. Drexel, Morgan & Company to reply to Mr. Lowrey and to state whether he has correctly set forth the arrangement between them.

(3) June 9, 1879. Apparently an agreement was made on this date between Mr. Edison and Colonel Gouraud, whereby the latter was given a one-tenth interest in all that the former got under any letters patent of the United Kingdom of Great Britain and Ireland, so far as relates to patents already granted or thereafter granted to the said Edison for a period of five years, that is to say until June 9, 1884. The said interest of Gouraud is to be subject to all concessions and payments which Edison may have to make to others. The said agreement further releases Edison from all prior claim of Gouraud touching any and all of the inventions or letters patent therein referred to. I have no copy of this agreement, but it is recited at length in the agreement mentioned next below in this letter,

dated July 21, 1879.

(4) July 21, 1879. This is an agreement between Messrs. Drexel, Morgan & Company and Mr. Edison, and after reciting the aforesaid agreement of June 9, 1879, between Edison and Gouraud, goes on very briefly to state that Messrs. Drexel, Morgan & Company shall pay to Mr. Edison one-half of all sums which he may pay to Gouraud in accordance with the said agreement of June 9, 1879.

(5) February 18, 1881. Mr. Edison has a copy of an assignment of this date, whereby for \$30,000., the law firm of Porter, Lowrey, Soren and Stone, assigned to Mr. J. Hood Wright an undivided one-tenth part of the whole interest originally owned by Mr. Lowrey in the Edison patents for Great Britain and Sweden and Norway. Attached to the assignment is a letter from Mr. Lowrey to Messrs. Drexel, Morgan & Company dated February 1, 1881, and a letter from him to Mr. Wright, of the same date. But these letters merely lead up to the said assignment itself of February 18, 1881.

(6) March 1, 1881. As I have already stated above, the agreement of December 31, 1878, mentioned at length at the beginning of this letter, provided for the concurrent execution and delivery of four supplemental instruments which are described on the last sheet of the said agreement. These four instruments do not appear to have been executed until March 1, 1881, which date they bear. They are as follows:

(a) A special power by Mr. Edison to Messrs. Drexel, Morgan & Company, appointing them his irrevocable Attorneys to dispose of his patents for Great Britain and Ireland and such other portions of the British Dominions as may be covered by them, being such inventions as are described in the agreement of December 31, 1878, which he might make before January 1, 1884, together with all further inventions which he might make between that date and December 31, 1895, the price to be satisfactory to Mr. Edison, or to be fixed by arbitration.

(b) Trust Agreement of March 1, 1881, from Mr. Edison to Messrs. Fabbri and Lowrey. This recites that the patents mentioned in the agreement were assigned pursuant to the foregoing agreement of December 31, 1878.

(c) An instrument containing covenant by Fabbri and Lowrey, as Trustees, declaring that they hold the Edison patent subject to the foregoing agreement of December 31, 1878.

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(d) A special power from Mr. Edison to Messrs. Fabbri and Lowrey, being of the same date as all of the foregoing three instruments, that is to say, March 1, 1881, constituting them his irrevocable Attorneys in fact to sell his inventions to such parties as Messrs. Drexel, Morgan & Company might appoint, pursuant to the last clause of the third section of the aforesaid agreement of December 31, 1878, with power of substitution.

Note:- The effect of the foregoing four instruments was merely to supplement and carry out the provisions of the foregoing agreement of December 31, 1878.

(7) May 31, 1881. The next document which I find, chronologically speaking, is one of this date, made between Messrs. Drexel, Morgan & Company, Mr. Edison and Mr. Johnson. It provides that Mr. Johnson shall take charge of the then proposed exhibition at London, and that he shall be paid a salary of \$500. a month, and shall further receive five per centum of the net amount received touching the patents or inventions so far as Great Britain and Ireland are concerned. But if the said five per centum amounts to \$100,000., it shall thereafter be reduced to two and one-half per centum.

(8) February 18, 1882. This is the Bouverie Agreement, and is executed by him, Mr. Edison, Messrs. Drexel, Morgan & Company, and Fabbri and Lowrey. It provides for the formation of the English Company, and for the assignment thereto of the several patents specified in annexed schedule, being all of the patents taken out by Edison or in his behalf relating to electric light, heat and power.

Section Nine of this agreement then goes on to provide that the said English Company shall have, without further payment, not only all extensions of the patents mentioned in the aforesaid schedule, but also all improvements which may be made by Mr. Edison in connection with the said inventions so far as they relate to "lighting, heating, and motive agent". But the said company was to pay to Mr. Edison all expenses leading up to such improvements, after patents for Great Britain are taken out, with one hundred per centum added, without reference to compensation received by him from other persons. Mr. Edison was further to receive from the company the amount of all expenses and fees necessary to obtain and keep up the said patents. The said section nine then goes on to say that as soon as Mr. Edison makes improvements and takes out patents therefor he shall inform the company of that fact and of the amount of expenses incurred in experiments and in obtaining and keeping up letters patent, and if the company shall within three months after receipt of such notice elect to

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acquire the improvements, the amount payable to Mr. Edison shall in case of difference, be fixed by arbitration, but if the company does not within the said three months elect to acquire the improvements, the company's rights thereto shall cease.

Section Fifteen of the said agreement provides that immediately after the assignment of any patents to the company, it shall grant to Mr. Edison or his nominees free and exclusive license to use the same or any improvements thereof for the purpose of locomotion on railways, on tramways, or common roads, and for all other purposes except light, heat and power, otherwise than for the purpose of such locomotion.

(Note:- The effect of this agreement upon the question under discussion in this letter will be considered by me further on, that is to say in Section Thirteen, when I discuss the license of November 15, 1883.)

(9) March 1, 1882. Power of Attorney from Mr. Edison to Messrs. Fabbri and Wright relating to the distribution of shares receivable under the foregoing agreement of February 18, 1882, and directing those parties to receive the said shares and to distribute them between Messrs. Drexel, Morgan & Company, Gouraud and Johnson.

(10) March 15, 1882. This is the date of the Memorandum and Articles of Association of The Edison Electric Light Company, Limited. I have before me a printed copy of this document, belonging to Mr. Edison's files. Annexed to it as a schedule, is a printed copy of the above mentioned agreement of February 18, 1882.

This agreement of March 15, 1882, ratifies and adopts the aforesaid agreement of February 18, 1882, and states that the objects for which the said company is formed are to carry that agreement into effect, to acquire the patents then specified and to acquire additional patents, &c.

(11) April 6, 1882. Apparently an indenture bearing this date was executed by Mr. Edison, by Mr. B. J. Brewer, by Mr. Jensen, by Messrs. Drexel, Morgan & Company, and by Messrs. Fabbri and Lowrey, assigning to the aforesaid English Company the several patents specified in a schedule annexed to the said indenture. I have no copy of this indenture.

(12) November 15, 1883. Indenture between the Edison Electric Light Company, Limited, Mr. Edison, and Messrs. Fabbri and Lowrey. This instrument is the license to use the British Patents for railway purposes, and is an important document in connection with the subject now under discussion. It opens by referring to the above mentioned Bouverie Agreement of February 18, 1882, wherein a license of this sort is provided for. It then goes on to speak of the incorporation of the London Company on March 15, 1882. It then refers to the above mentioned indenture of April 6, 1882. It then recites that Mr. Edison has appointed Messrs. Fabbri and Lowrey to be the licensees touching the aforesaid railway license, and that the company has consented to grant to them the said license.

After the foregoing recitals, the instrument goes on to give to the said Trustees, Fabbri and Lowrey, and their assigns, a full license to use all patents specified in the schedule annexed to the document, or any improvements thereof, for the purpose of locomotion and for all other purposes except light, heat and power otherwise than for such locomotion, during the term of said patents or any extension of them.

The agreement goes on to provide that the company may disclaim, without the consent of the said Fabbri and Lowrey, except in the case of patents referring exclusively to locomotion, and may at any time permit "any of the said patents" to lapse, provided that the company shall give Edison three months notice of any intention to let a patent lapse; and shall at his request assign such patents to him or his nominees to the end that he may keep said patents alive if he wishes to.

The license then goes on to provide that whenever the said company shall, under the agreement of February 18, 1882, "become possessed of or entitled to any improvements made by Mr. Edison upon or connected with the said inventions protected by said patents, the company shall forthwith cause such improvements to be communicated to the licensees, Fabbri and Lowrey, and they shall be entitled to use the same" under the license.

The agreement further provides that the licensees may sue infringers, if the company does not. Annexed to this license is a Schedule of Patents, and I find a lead-pencil Mem. by Mr. Coster to the effect that the said Schedule should also include No. 1,862 of April 18, 1882, and No. 1,022 of February 24, 1883.

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(13) April 8, 1884. I find among Mr. Edison's papers a Power of Attorney of this date from the Bentley-Knight Electric Railway Company, Mr. Lowrey, Mr. Fabbri and Mr. Edison, to Thomas James Montgomery, authorizing him to dispose of patent rights relating to locomotion. Apparently this power was never executed. At any rate the copy before me has no signatures.

(14) February 7, 1885. I find a letter from Mr. R. N. Dyer to Mr. Coster, of this date, specifying the foreign patents taken upon Mr. Edison's electric railway inventions.

(15) March 25, 1880. I have before me an original letter of this date from Mr. Lowrey to Messrs. Drexel, Morgan & Company, stating that he has arranged for them to have sole control of Mr. Edison's inventions in Portugal, New Zealand, New South Wales, Queensland and Victoria. Messrs. Drexel, Morgan & Company are to bear all expenses, and net proceeds are to be divided sixty-five per centum to Mr. Edison and thirty-five per centum to Messrs. Drexel, Morgan & Company, and Mr. Lowrey to receive one-third of the said share to Messrs. Drexel, Morgan & Company. The title to inventions and patents is to be assigned to Mr. Fabbri and Mr. Lowrey, as Trustees, under trusts similar to those already arranged for England.

On the back of this original letter, which is lent us by Mr. Coster, is this lead pencil mem. in his handwriting., to wit: "No contracts seem to have been prepared for these".

(16) March 25, 1880. I have another original letter of this date from Mr. Lowrey to Messrs. Drexel, Morgan & Company. It refers to Sweden and Norway, and states that Mr. Lowrey is to have one-third of the one-half interest in net proceeds accruing to Messrs. Drexel, Morgan & Company touching Sweden and Norway. Mr. Lowrey further states that his interest is for account of his firm of Porter, Lowrey, Soren and Stone.

(17) December, 1880. Mr. Coster lends us the following letters tied together in one package, relating to the countries named below.

(a) Copy of letter of December 14, 1880, from Mr. Lowrey to Mr. Edison, referring to a letter of March 25, 1880 from same to same, and asking Mr. Edison to confirm said letter.

(b) Copy of a letter from Mr. Edison to Mr. Lowrey dated December 15, 1880. This letter opens by referring to the aforesaid letter from Mr. Lowrey of March 25, 1880, in which he stated the arrangements made by him with Messrs. Drexel, Morgan & Company in respect to Portugal, New Zealand, New South Wales, Queensland and Victoria, and with Mr. Navarro for Cuba, and with Mr. Fabbri and Chauncey for



India. Mr. Edison's letter then goes on to state that he confirms Mr. Lowrey's said letter of March 25th.

(c) December 16, 1880. Copy of letter from Mr. Lowrey to Mr. Edison, referring to the aforesaid letter of the previous date from Mr. Edison to Mr. Lowrey. This letter relates only to the question of making exhibitions in India &c., and is not important.

(d) December 16, 1880. Original letter from Mr. Lowrey to Messrs. Drexel, Morgan & Company enclosing a copy of the foregoing correspondence relating to Portugal, New Zealand, New South Wales, Queensland and Victoria, and asking Messrs. Drexel, Morgan & Company to approve of his letter to Mr. Edison of December 16, 1880.

Note: As regards Portugal I find nothing to conflict with the above mentioned lead pencil mem. of Mr. Coster, which was to the effect that no contracts seem to have been prepared, but as regards Sweden and Norway I find a set of agreements as specified below:

(18) March 1, 1881. Agreement between Mr. Edison Messrs. Drexel, Morgan & Company, also Messrs. Fabbri and Lowrey, as Trustees, relating to Sweden and Norway, and covering inventions relating to illumination, power, and heating. Messrs. Drexel, Morgan and Company agree to reimburse Mr. Edison for all sums theretofore paid by him on account of the applications for patents "not exceeding One Dollar" (this is the way it is written in Mr. Edison's copy of the original agreement signed by him), and to pay all further charges in securing future patents.

The second section of this agreement provides for the transfer to Messrs. Fabbri and Lowrey, as Trustees, of all title to inventions already made. Those parties are to hold this title subject to the directions of Messrs. Drexel, Morgan & Company, and if the last named firm do not dispose of the inventions by March 1, 1884, they are then to be assigned back to Mr. Edison but subject to outstanding licenses.

The third section contains an assignment by Mr. Edison to the Trustees of all his title for Sweden and Norway, for "other inventions or improvements" made prior to March 1, 1886.

In the fifth section there is a provision that whenever Messrs. Drexel, Morgan & Company fail or refuse to advance the sums requisite to obtain or defend Letters Patent for any invention, Mr. Edison may by written notice require the said Trustees to convey the title back to him. The seventh section contains an agreement by Mr. Edison to constitute Messrs. Drexel, Morgan & Company his attorneys in fact to dispose of, (where purchasers have already secured an interest in his patents) "a like interest" in all future inventions which may be made by him, or for which patents may be granted to him, subsequent to the termination of the period of five years above mentioned,

at a price to be mutually agreed upon, or to be fixed by arbitrators. (This date is extended to March 1, 1898. See Sec. (21) below).

In the case of all inventions for which Messrs. Drexel, Morgan & Company have advanced or paid the expenses as provided for in the first section of this agreement, the price realized by them from purchasers shall be divided equally between them and Mr. Edison.

(Note. This agreement is substantially the same in its terms and provisions as the agreement of December 31, 1878, relating to Great Britain and Ireland.)

(19) March 1, 1881. Power of Attorney from Mr. Edison to Messrs. Fabbri and Lowrey, relating to Sweden and Norway and being one of the instruments provided for in the agreement last mentioned above.

(20) March 1, 1881. Covenants by Messrs. Fabbri and Lowrey, Trustees, relating to Sweden and Norway, and being another instrument provided for in the agreement mentioned above in Section (18).

(21) March 1, 1881. Power of Attorney from Mr. Edison to Messrs. Drexel, Morgan & Company, relating to Sweden and Norway, and being still another instrument referred to in the above mentioned agreement described in section (18). This power recites all inventions, discoveries, improvements or devices relating to "illumination, or power or heating", and refers, in the first instance, to inventions made before March 1, 1886. The power then goes on to authorize Messrs. Drexel, Morgan & Company to agree with the purchasers of any of Mr. Edison's inventions &c. made before March 1, 1886, that they shall have "like title or interests or rights" in all further inventions which he may make at any time between March 1, 1886, and March 1, 1898.

Scrapbook, Cat. 1135

This scrapbook covers the period October-November 1881. Included among the clippings is a report of the annual meeting of the Edison Electric Light Company in New York City. The remaining clippings pertain to applications by various companies for permission to engage in the business of electric lighting in the United Kingdom. The book contains 144 numbered pages.

Blank pages not filmed: 4-144.

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Scrapbook, Cat. 1139

This scrapbook covers the period November 1882-December 1884. It contains clippings relating to various international electrical exhibitions. Included are descriptions of both Edison's exhibits and those of his competitors at exhibitions in Munich (1882), Vienna (1883), Boston (1884), London (1884), and Philadelphia (1884). The inside front cover is inscribed "Electrical Exhibitions not yet Classified. Vol. I." The pages are unnumbered. Approximately 40 pages have been used.

E 173-158

1129

*Original Collection not yet classified.*

*Vol. I.*

THOS. A. EDISON











The foregoing list indicates how successful Messrs. Ganz and Co. are prosecuting the business of electric lighting on a large scale.















Fig. 1

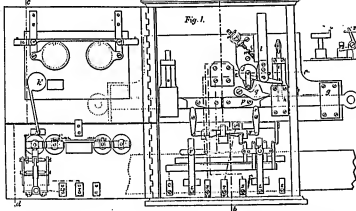


Fig. 2



Fig. 3.



2. *The Hydraulic Recoil Press.*—This name is appropriated to that class of buffer which is used in the very large guns, and whose function is not only to check the recoil of the gun, but to run it in and

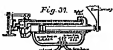


Fig. 32

these valves is so regulated that while the force of recoil is sufficient to force them open, they yet offer sufficient resistance to absorb the recoil within the limits required, while at the same time they are too powerful to be opened by the ordinary hydraulic pressure necessary to run the gun in and out. For a full description of this hydraulic recoil press, see "Hydraulic Manual" by Lieutenant A. Harrow.

In the compressor, which is fitted to the 6-in. breech-loading gun, of the two pistons fixed to either side of the slide, one is in the rear and the other in front, both working in cylinders attached to the carriage. A tube joins the two cylinders, so that the fluid displaced from one by the piston entering can run into that from which the piston rod is withdrawn. To this tube a cock is attached which stops the flow of liquid when required, and thus holds the gun in a seaway.

that it controls the recoil, the orifice being open to the full extent at the time when the gun has its maximum energy of recoil, and then gradually closing as the energy diminishes, so that the pressure on the colinder is kept uniform throughout.

The question of recoil is a very interesting one, and it would, we think, repay any reader to study it. Information on the subject will be found in "The Manual of Gunnery for Her Majesty's Fleet, 1880," page 62 to 76, and "Treatise on Military Carriages, 1879," page 136 to 138.  
(To be continued.)

## RAILWAY COMPANIES' EXHIBITS

*The Eastern Railway of France.*—Collectively the three principal departments of this important company—those of management, of rolling stock and traction, and of construction—made a very large exhibit.

[illegible]

**Fig. 4**



Fig. 6. Section on a C.

[illegible]

## LITERATURE.

*A Practical Treatise on Electricity and Magnetism.* By J. E. H. GUNTER, B.A., Cambridge, Member of the International Congress of Electricity, Paris, 1881. Manager of the Electric Light Department of the Telegraph Construction and Maintenance Company, Glasgow, London, London, and Liverpool. We are glad to see this work has reached its second edition, for it is a meritorious effort to fill up a gap in our scientific literature. On the one hand, we have excellent elementary manuals, such as that of Professor Thomson, or of Dr. Silvanus P. Thompson; and on the other, for the advanced mathematical reader, we have the admirable articles on electricity and magnetism in the "Encyclopædia Britannica," by Professor G. Church, and above all the masterly treatise of Clerk Maxwell.

Mr. Gunter has done a very useful work in expanding the leading principles of his subjects without clogging in the aid of the higher mathematics, in describing and illustrating the standard instruments with remarkably few plates and diagrams, and in discussing the results of the more important series of researches and determinations.

No doubt the task was not an easy one. It requires history, careful and extensive reading, nice discrimination, and good powers of analysis to select from such an enormous *résumé* as enormous the physicist what is necessary and suitable for a treatise, and to present it in a form diminished, it is true, yet complete and elegant.

In a work purporting to be a survey of the whole electrical field, some care also is needed to avoid proceeding too hurriedly over certain barren fields in order to get to the more fertile regions in a plentiful harvest of experimental results. Mr. Gunter does not seem to have detected himself against the charms of well-written and copiously illustrated papers, as appears from the references to Spottiswoode, Crookes, and De B. Rue on the phenomena of cohesion, and to the numerous experiments of Professor Ayrton and Perry on contact electricity; to the electrolytic studies of Mr. A. Tribe; and to the curious experiments of Professor Bjerknes and of Mr. Stroh, in which various electrical and structural phenomena are strikingly imitated by ingenious mechanical contrivances.

Many details are necessary in the Transactions of societies; in a treatise, they are usually superfluous and pedantic, and are often inserted to the exclusion of more relevant matter.

In Mance's *Treatise of Electricity and Magnetism* we find a summary of the experiments and principles of research connected with static electricity, given in a masterly style, and with exceptional clearness. Hence the great intrinsic value and the success of the French physicist's work.

If the same condensing power and discriminating acumen had been used in preparing the physical treatise, sufficient space would have been found for accounts of important investigations, such as those of Professor Clifford on the contact force between a metal and a liquid, of W. H. Preece on the influence of temperature on the resistance and electrostatic force of batteries, or of Professor Zitt on thermo-electricity. Nor was Maxwell's work on the communication to the *Electrician* in April, 1879, a mere afterthought, but might have been suitably appended to Chapter XXII. of the measurement of the infinitesimal tending to show that the contact difference between copper and zinc is 700 vells, and that it is more reliable as a standard of electromotive force than a Latimer Clark's cell.

Approach of thermo-electricity, which will familiarize the reader with the current terminology and nomenclature of the Joule and Thomson effects, as well as of the Peltier effect and why not summarize La Roca's work, and last of all the specific heat of electricity and show how it is represented on the thermoelectric diagram? In a general work, we do not expect an exhaustive treatment of the subject of electrical measurement; but, since it was deemed inadvisable to give Mance's work the same treatment, the internal resistance of a battery, and to point out its practical convenience, we would have expected some information about one or other of the condenser methods that have been lately devised.

In this communication occurs the following: "It is found by thermoelectric experiments that the electromotive force between copper and zinc is exceedingly small, being less than a microvolt."

in this country for overcoming this inconvenience, e.g., that of Kempe or of Dr. Lodge.

Some exception may be taken to such statements as the following: "The dimensions of plates placed between the (Latimer Clark's cell) polarizing elements constant; . . . we can say so much of the electrical changes as are due to mechanical stress of the inductor; . . . 'the zero of this curve is the *ad hoc* zero of the electromotive force of the cell'; . . . 'change of motion (in Norton's second law, *namque change of velocity*; . . . 'the apparatus (the motor) is used to the extent of its power; . . . it is acceptable of any great success'."

It may be useful to point out by the way that this statement that Professor Church says of the micro-volt in article Electricity, "Encyclopædia Britannica," page 614: "The *ad hoc* for comparing resistances with great accuracy is the modification of Wheatstone's bridge, introduced by Kirchhoff."

We are not concerned in the philosophical notions which led to the election of the second *ad hoc*; but it may be of importance to point out its inaccuracy that occurs (in both editions) in the paragraph differentiating the ballistic from the ordinary galvanometer, viz., the transposition of the words "former" and "latter," by which the very opposite of what is intended, is conveyed.

It may also be well to state that the connection shown in Fig. 107 are made as they should not be. In the adjoining text we read: "The slider usually carries a spring and a vertical sliding rod, to which the battery wire is attached." It is especially recommended in physical laboratories to do so, for the friction and breaking contact on the platinum-iridium micro-wire—would alter its surface conditions, and none would be able to do so.

Notwithstanding the few inaccuracies and deficiencies that we have pointed out, the treatise is valuable to the electrical student. No one who wishes to know what has been done in the vast domain of electricity can do without it, whilst those who have time and opportunity for original work will find its pages useful and suggestive, particularly before starting on any new extension of some part of the electrical field.

*Hydraulic Manual, containing of Working Tables and Explanatory Text, intended as a Guide in Hydraulic Civil and Mechanical Fluid Operation.* By LEONARD A. JACKSON. Fourth Edition, Revised and Enlarged. London: George Lockwood and Co., 1883.

This valuable work, with which many of our readers are well acquainted, is now entering on its fourth edition, and comes out considerably enlarged and improved. Irrigation and water supply were among the chief branches of civil engineering, and reach back to pre-historic times, but it is only lately that the subject to which they belong has fairly entered the region of accurate scientific investigation, and even now such is being done and made so rapidly, that the knowledge of the science in hydraulic engineering, both in South America and in India, has been a careful observer of the facts which have come under his notice, as well as in a painstaking collector and critic of the results of the experiments of others, and from the great mass of materials at his command he has constructed a manual which may be regarded as a trustworthy guide in the hands of the engineer's profession. Recent progress has necessitated very considerable changes and modifications in the present edition, and the results of Major Allan Cunningham's celebrated experiments upon the Gangetic Canal have added to the sum. As an aid to the engineer or reader as not familiar with the work, we may give a short summary of its contents.

The work is divided into two parts, the first discussing the general principles relating to rainfall, flood discharge, and the discharge from channels and rivers, sluices, weirs, and reservoirs. Chapter II relates to field operations, and gives and describes the various instruments employed and methods followed in determining the flow of streams and channels. Chapter III is devoted to miscellaneous subjects, such as modulations, the work of floods, tides, irrigation, and the remainder of the work.

\* The tables are new.

† See also Ouse G. C. Potter's paper in Journal of the Society of Telegraph Engineers, 1882.

comprising 172 pages, consists of tables representing an enormous amount of work on the part of the author, and his readers may be sure that they will find the work in the book in their daily work.

We can hardly recommend this volume to all who desire to make the most of their time, and to this important subject, or to compare their own practice with that of other workers in the same subject in various parts of the world.

## THE VIENNA ELECTRICAL EXHIBITION.—No. XII.

*Accumulators.*—The exhibition of electricity was presented at the Vienna Exhibition by numerous inventors. Mr. Planck showed several of his secondary batteries. There was nothing new, however, in the arrangement, if we except the small model intended for use in mines, to replace the Davy or small cells contained in an early portable box, and which can be carried like an ordinary lantern. On the top of the box is a strong lamp glass, and the tubes, clamped in tension are charged by two tubes in half an hour for each cell. The lamp burns during the full hour with an intensity of about one candle; it then begins to fail and becomes extinct in about a quarter of an hour.

As speaking of the exhibition of the Electric Lighting Company we referred to three groups of accumulators exhibited in competition with each other, the Munich, the London, and the Paris-Expo lamps.

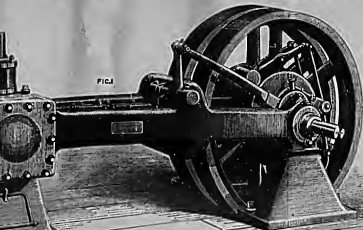
Mr. Kerschall exhibited a novel accumulator in which the liquid electrolyte is made to make a wide application on the surface and in the openings of the plates. The electrolyte is made to make a wide application on the surface and in the openings of the plates. The electrolyte is made to make a wide application on the surface and in the openings of the plates.

A series of three tubes, of the same height but of varying diameter, are introduced one within the other, concentrically, so that between these member spaces are left. The tubes, fixed into a wooden base, are placed in a glass or earthenware jar and the inner and outer surfaces are then well be referred to presently. The tubes are maintained at the proper distance apart by glass rods, and by two rings of rubber which prevent their shaking in the jar. The arrangement now here has the advantage of preventing the inconvenience inherent to the employment of plates, that is, the swelling of the oxidized metal, the necessity of getting rid of the gas, and the necessity of holding the tubes in place. The cylinder is very much held the tubes in place. The cylinder is very much held the tubes in place. The cylinder is very much held the tubes in place.

of the apparatus, is certainly very practical; the jars, as we have seen, are made of glass, and are covered with a wax, the composition of which will be referred to presently. The tubes are maintained at the proper distance apart by glass rods, and by two rings of rubber which prevent their shaking in the jar. The arrangement now here has the advantage of preventing the inconvenience inherent to the employment of plates, that is, the swelling of the oxidized metal, the necessity of getting rid of the gas, and the necessity of holding the tubes in place. The cylinder is very much held the tubes in place. The cylinder is very much held the tubes in place.

secondary battery by reducing the thickness of the

## STRAIGHT LINE ENGINE, PHILADELPHIA EXHIBITION.



## THE PHILADELPHIA ELECTRIC EXHIBITION.

It is accordance with the plans laid down and announced months ago, the International Electrical Exhibition, under the auspices of the Franklin Institute, was duly opened on September 2nd. Compared with former exhibitions this is the smallest as regards space occupied, but one soon sees that the affair is of a highly practical character, and that there are many high-class exhibits and fewer of the gaudy-modelled and silver-plated class. The building, which is constructed of rough wood with little attempt at interior decoration, is in West Philadelphia, and is easily reached by the tramway which passes over the Schuylkill by a singularly frail bridge consisting of wooden lattice work. The history of the construction is that during the Centennial Exhibition an extra bridge was required, and this was put up as a temporary expedient in the short space of thirty days. It has been condemned as made for men, and the work of building a permanent structure is slowly progressing.

As regards the International character of the Exhibition, one is struck by the almost entire absence of the well-known European exhibitors. All that are represented have placed their goods in the stands of American firms; for instance, the stand of the Electrical Supply Company, of New York, includes a splendid collection of measuring instruments from Elliot Brothers, Gallen's battery covered wire, which is largely employed both for overhead and underground work, and Edison's patent cut-out and safety fuses, which are also used for the protection of the electric wires in the building.

The light is well represented by the well-known systems of Brush, Weston, Hochhausen, as well as the newer inventions of Thomson, Houston, Van der Poeler, and the Western Electric Company. The incandescent display is represented by only a few, the principal being the Edison Company, who have a most magnificent show of some 2000 lamps, maintained partly by one of the large 1000-light dynamo exhibited by the United States Electric Lighting Company, which is the most interesting in the Exhibition, in that it embraces some sixty-five Weston arc lamps, 1100 16-candle power lamps, and 100 large incandescent lamps of 125 candles each. We intend shortly illustrating this system, which has undergone considerable alterations. The gridiron form of filament introduced by Maxin has been discarded for a screw thread kind, which is made from this sheet of celluloid, the extrusion process being carried out at the Exhibition by means of a specially designed extrusion pump. Both Edison and Weston show their most recent designs for working incandescent lights at a distance, with high electric-current forces and corresponding saving of copper. It is well understood that any system of incandescent lamps must be applied in this manner, in order to compete with the cheaper arc light, which owes some of its success to the ease in which the No. 8 h.w.g. wire can be fed into the building to be lighted.

The motive power is obtained from several descriptions of steam engines, one of the most novel, and at the same time the most practical, is that known as the straight line engine, which has been designed by Mr. J. E. Sweet, especially for electric light work. The general arrangement, Fig. 1, is not unlike other high-speed engines, but its details, which are a simple eccentric, which is shifted by a connecting rod, is

pivoted and the valve motion so designed that the steam admission is constant. The eccentric can be shifted from its greatest throw, which gives steam during three-fourths of the stroke to its least throw, which only equals the lap of the valve, and as the governor is very powerful, and the work it has to perform is light, the speed is maintained practically uniform independent of the work. The engine exhibited at work is one having a 10-in. cylinder by 16-in. stroke, it runs at 222 revolutions per minute, and indicates 50-horse power at its maximum speed. The line of shafting driven by this engine runs at the high speed of 350 revolutions—in fact, all shafting may be taken as running much faster than is common here. Most of the pulleys, both on the dynamo and shafting, are of the class shown in Fig. 2. They are constructed of wooden segments with wooden rims, securely built on, and are fixed to the shafting either by a taper sleeve or by bolting on in halves. A better adhesion of strips is secured by their use,



and a lighter shafting will carry them. American practice seems to favour high speed horizontal engines, but the single-acting rotary kind is also represented largely by the Westinghouse and Brotherhood engines, which we have already illustrated. In order to facilitate the work of the Board of Examiners, the Exhibition has been divided into twenty-nine sections, of which all the details have been



settled. Each section will send a report to the executive committee, which will publish the results. The examinations have already commenced, and by the plan of subdivisions it is expected that their labour will be much facilitated.

# THE PHILADELPHIA ELECTRICAL EXHIBITION.

The Philadelphia Electrical Exhibition opened at Philadelphia is stated to be the most complete exhibition of the kind ever held, and to surpass all previous exhibitions in showing to what a wonderful extent electricity has entered into common use. The number of exhibits is about 1,500, which are divided into twenty-nine classes, embracing, with a few slight exceptions, every branch of electrical science. Among the many inventions exhibited are storage batteries for both light and power, and the synchronous multiplex system of telegraphy, by which, it is said, seventy-two distinct messages can be sent over one wire simultaneously. The United States government here a full exhibit, showing the different applications of electricity to the ordnance and lighthouse departments and the signal service. The Smithsonian Institution here sent, as a curiosity to compare with the synchronous multiplex system machine, the key of the machine with which Professor Morse transmitted the first message ever sent over a telegraph wire. This exhibition will be the seventh electrical exhibition, and it will be the first ever held in the United States. The last electrical exhibition was held at Vienna in 1883. Two were held in 1883 at London (Crystal Palace and Aquarium); one was held at Marseilles in 1882, one at London (Crystal Palace) in 1881-82, and one at Paris in 1881.

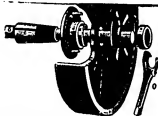
Engineering - Dec. 14, 1884.

## A PHENOMENON OF THE EDISON LIGHT.

In Mr. Edison's exhibit at the Philadelphia Exhibition a curious phenomenon was shown. Midway between the legs of the filament in an Edison incandescent lamp an insulated electrode of platinum strip was inserted, the tip of the electrode ending about  $\frac{1}{8}$  in. below the end of the lamp. When the lamp was in action, if a galvanometer was connected between the electrode and one terminal of the filament, a current was observed, which changed in direction according as the + or - terminal of the carbon was connected to the instrument. This shows that there is a discharge or current through the vacuum of the lamp. The current was many times stronger when the + pole of the carbon was that connected. The current was also increased by increasing the current in the lamp. After the lamp has been in use some time the positive-platinum or stronger current becomes weaker, possibly through some effect of polarization such as that noticed by Edmund in his experiments on the discharge through vacuo. On letting the lamp rest the current recovers itself again. A current was also obtained through the glass of the lamp by laying the platinum electrode on it outside. It would appear that in these lamps the air (or carbon) particles are disengaged in a charged state from the filament in right lines.

The gridiron form of filament introduced by Maximo has been discarded for a serrated kind, which is made from thin sheets of celluloid, the relaxation process being carried out at the Exhibition by means of a specially designed machinery pump. Both Edison and Weston show their latest designs for working incandescent lights at a distance, with high electro-motive force and corresponding saving of copper. It is well understood that this manner, in order to compete with the cheaper arc light, which owes some of its success to the ease in which the No. 0 h.w.g. wire can be led into the building to be lighted.

The motive power is obtained from several descriptions of steam engines, one of the most novel, and at the same time the most practical, is that known as the steam engine, which has been designed by Mr. J. E. Sweet, especially for electric light work. The general arrangement, Fig. 1, is not unlike other high speed engines, but in details, notably a single eccentric, which is shifted by a governor, Fig. 2, automatically controlling the cut-off, as the eccentric is so



settled. Each section will send a report in to the executive committee, which will publish the results. The examination have already commenced, and by the plan of subdivision it is expected that their labour will be more facilitated.

The old German ironworks, Krupp and Friedrich Karl, are to be equipped with torpedo apparatus.

grinding in. *W N G* is the valve with stuffing box, and with a *ground-in* seating R.

#### Hot Water Bib Valves.

This class of valve is very numerous, and they are nearly all made on the same principle as the screw-down cock. Fig. 453 illustrates a very good one, and I wish to draw your attention to the potential kind of failure not as shown at A; this is a very simple contrivance, to prevent the nut from turning round when the cock is being screwed off, &c., and is something that has been long wanted to be made *better known* to the public. In judging cocks and valves, and when selecting them, always select those which will work nice and smooth, and without jumping or turning irregularly, for this is a sign that the key and spindle are not true, though in place it will trip through and bottoming, bent spindles, &c., &c.

Clatern and Boller Barrows.

hook set up without cutting the grummet, unless you use a *had* or other washer not the back-out, which only occasions additional trouble and expense. It may be well to say that this rule holds good with nearly all other connectors, such as die or iron claterns, washers and unions, spindle valves, &c., as illustrated at F and S (Fig. 463).

#### Iron and Steel Clatern Washers and Washers.

These are shown fitted at S W T II (Fig. 459). Fig. 464 is a connection for fitting the lead pipe to top of hot-water cylinder, boilers, &c. It has this "Flange" and is tightened-up from the outside by means of the back-out R. This is also handy for connecting the waste-pipe to earth-worm obstructions, &c. It is also used for the bottom of tanks, barrels, wash-basins, &c.

### THE PHILADELPHIA ELECTRICAL EXHIBITION.

THE International Electrical Exhibition in

Philadelphia is, as our readers are aware, held under the auspices of the Franklin Institute, the object being to give the American electrician an opportunity of comparing his work with that sent from other countries, and also to afford the public an opportunity of becoming acquainted with electrical appliances. Very wisely the committee of management decided not to give medals and prizes, but offered to make official examinations of any machines or instruments when so desired; and, although the Exhibition remains open for only a short time comparatively speaking, there is no lack of exhibits and a fair sprinkling of novelties. Besides the usual run of dynamo and lamp, there is an electrical railway, a system of working railway signals by electricity, several suggested methods of putting telegraph, telephone, and other cables underground, and a variety of storage batteries. The Edison Company, of course, occupy a prominent place as regards the number and importance of their exhibits; but they are very close in the matter of important novelties by the Weston Company and the Thomson-Houston Company. Two dynamos placed on exhibition by the Edison Company are, in some not unimportant features, essentially novel. One is a type of disc machine, and the other a 1,200 incandescent lamp machine. The principle upon which these two machines are constructed is the same, but the application is dissimilar. In the disc dynamo there are two electro-magnets of the horseshoe pattern placed upon a horizontal plane surface, having their opposite poles in series. Radial segments forming a disc of copper revolve between the poles. These segments are insulated the one from the other. Upon the periphery of the disc there are a number of thin pieces of copper—each being likewise insulated—connecting certain pairs of segments. The armature of the dynamo is the disc itself, and, as in the case with the wire of the armatures of dynamos of the regular type, the current is carried by the passage of the segments through the lines of force of the magnet. The rate is the initial point of departure of the current in this machine, thence it traverses the segment *en route* to the circumferential strip. After completing half the circumference and reaching another segment, it is led off by the brushes from the commutator. The current has, therefore, three consecutive times been led by the poles of the magnets; an operation which has served to increase it. The great 1,200 incandescent light dynamo is again different from this. The magnet does not differ from that found in the Edison dynamo of the well-known type, save in its immensity. It is the armature of this machine which is particularly unique. There are circular iron plates forming the core placed radially to the plates in the ordinary dynamo. On these, however, set up longitudinally, are copper bars 1 of an inch wide and having a thickness of  $\frac{1}{16}$  inch, each is served with a coating of parchment paper and mica for the purpose of rendering them well insulated, not only from the core, but from each other as well. There are spaces between these bars through which a current of dry air can be forced, so as to prevent, at all times, the formation of burning heat. Then there are circular strips of copper at the end of the machine served with varnish in order to insulate them from each other. The bars joined in pairs to the varnish strips. The commutator is not reached by the current until the latter has

## EXHIBITS AT THE PHILADELPHIA ELECTRICAL EXHIBITION.

(For Description, see Page 607.)

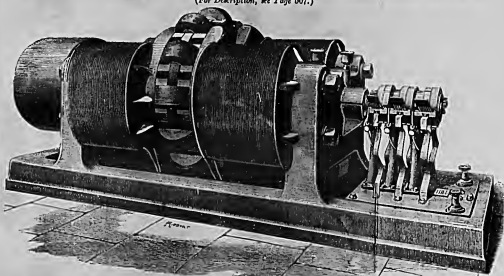


FIG. 1. BRUSH DYNAMO FOR SIXTY-FIVE AMP LAMPS.

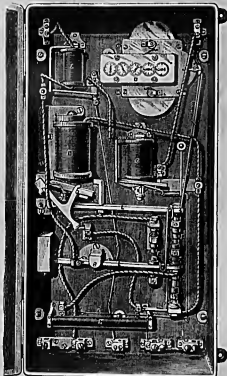


FIG. 4. THE BRUSH SECONDARY BATTERY MANIPULATOR.

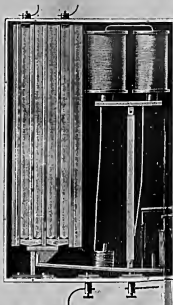


FIG. 2. BRUSH CURRENT REGULATOR.

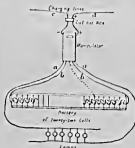


Fig. 3.

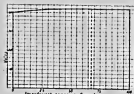


Fig. 4





performed in a Government or private establishment, or by dividing the work between Government and private works. To arrive at this conclusion inquiries were sent to the various private establishments. Lieutenant Jaques considers finally that the question will be thus effectually dealt with if a sufficient appropriation of money is voted by Government.

#### THE PHILADELPHIA ELECTRICAL EXHIBITION.

These inventions of Mr. Edison were displayed in an exhibit which was made up by seven different companies and individuals. Mr. Edison showed his inventions in tele-

graph, his etheroscope, odoscope, microscopimeter, and several other instruments with queer sounding names, which did not come within the objects of our visit. There were the exhibits of the separate companies working the lamp, machine, and underground conductors; also that of

the armature, which is composed of bars of cast copper lin. by lin. and 4 ft. dia. long, and having a total weight of four tons, with that used in an ordinary dynamo. With the exception of "Jumbo," the Edison machines have lost some of their characteristics such as the double pair of

bearings however seen to give some trouble, as those in the large dynamo machine were kept cool by means of a stream of water circulating through them. All the Edison exhibits were interesting, but that which claimed the greatest attention from electric engineers or others interested in the problem of the best means of distributing the electric current for lighting purposes was the assortment of working models illustrating the underground conductors of the Edison Electric Tube Company of Brooklyn. To understand the important changes which have taken place in the form of the conductors, which enable a saving to be made of about 60 per cent. of the weight of copper necessary to carry a given current, one must go back to the Edison exhibit at the Electrical

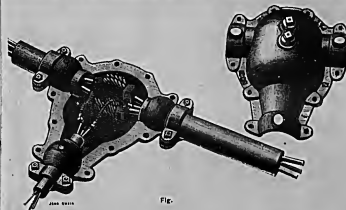


Fig. 4

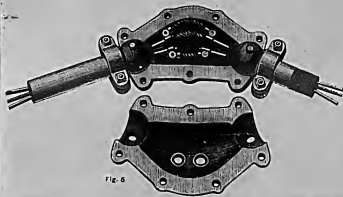


Fig. 5

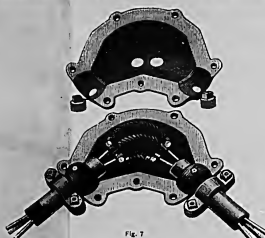


Fig. 6

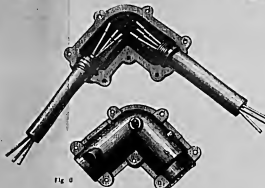


Fig. 7

#### EDISON'S LEAD CONNECTIONS.

graph, his etheroscope, odoscope, microscopimeter, and several other instruments with queer sounding names, which did not come within the objects of our visit. There were the exhibits of the separate companies working the lamp, machine, and underground conductors; also that of

the armature, which is composed of bars of cast copper lin. by lin. and 4 ft. dia. long, and having a total weight of four tons, with that used in an ordinary dynamo. With the exception of "Jumbo," the Edison machines have lost some of their characteristics such as the double pair of

Exhibition in Paris. The Edison underground conductors then were of semicircular section, the flat faces of each pair being opposite to one another, and separated by half an inch of the same composition with which the tube in which they were embedded was fitted—Fig. 1. At certain distances expansion boxes were put in to allow for the rise in temperature of the conductor, which were so proportioned that the heating temperature was 50 deg. Fah.



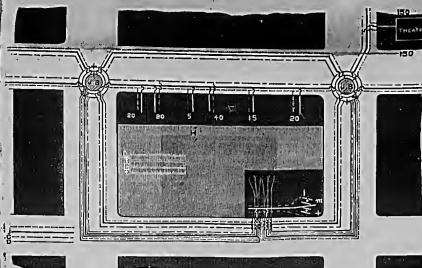
Fig. 1

These conductors are still manufactured, although we were informed that since the introduction of the three-wire system which we now illustrate there is little demand for the older form. The difference between the two plans of the distribution will be easily understood by referring to the



Fig. 2

plan, Fig. 2, which represents a Supply Station and the arrangement of electric mains. Two dynamo machines are used to work the system. They are marked as in the diagram, the third or neutral wire B being the return for the two machines.



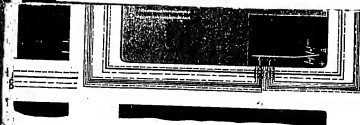
the corporation for central station lighting and private installations. The office of the combined exhibit was admitted to the testing station, and the wires from the

long poles; these are now much shorter and reduced to two—in fact, the appearance of the newest machines is more like the improved Hopkinson type.

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# THE EXHIBIT

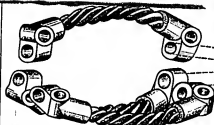
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the corporation for central station lighting and private installations. The office of the combined exhibit was also fitted as the testing station, and the wires from the dynamo were led where numerous instruments were displayed for reading current, testing potential, and controlling the output of each machine by the observation of

long poles; these are now much shorter and reduced to two—in fact, the appearance of the newest machine is very like the improved Hopkinson type.

The position of the brushes is well arranged in all the Edison machines, and it is quite the exception to see any marking or marks of scoring on the commutator; the



plan, Fig. 2, which represents a Supply Station and arrangement of electric mains. Two dynamo machines are used to work the system. They are marked as in the plan and are joined in series, the third or neutral wire B is connected to the junction between the two machines, and the positive and negative wires are lettered A and

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### THE STRAINS ON CIRCULAR LOCK-GAS

No. 1

FIG. 1

Nov. 21. 1884

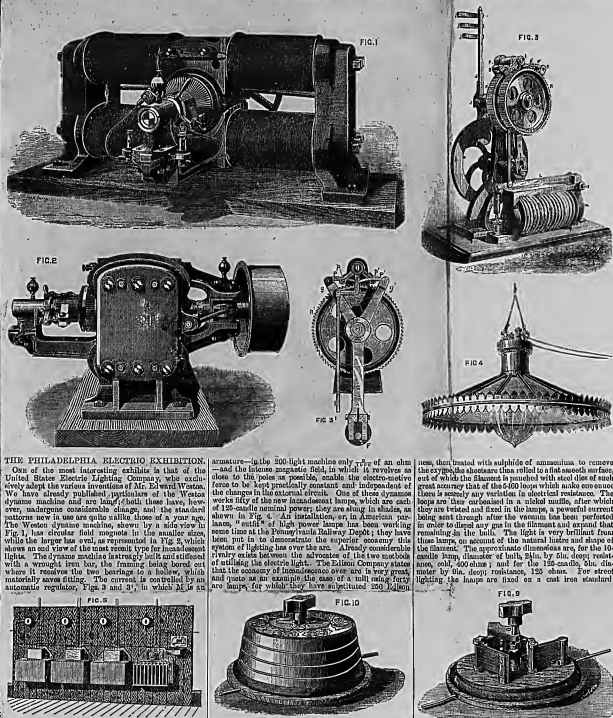
Two Conductor System.				Three Wire System.			
Outside size of insulator.	Area of wire conductor, sq. cils. mils.	Maximum current, amps.	Insulator size, No.	Area of wire conductor, sq. cils. mils.	Maximum current, amps.	Insulator size, No.	
2 1/2 in.	67,250	370	144.	100,000	500	144.	
2 in.	49,151	270	21n.	65,211	580	480	
1 3/4 in.	287,951	320	144.	224,000	400	480	
1 1/2 in.	182,000	320	11n.	141,000	315	315	
1 1/4 in.	120,050	320	11n.	90,000	225	225	
1 1/8 in.	62,582	170	11n.	56,614	165	165	

[illegible][illegible][illegible][illegible][illegible]

YESTERDAY was the 75th birthday of M. de Lampa, an octogenarian.



## WESTON'S ELECTRIC LIGHT APPARATUS, PHILADELPHIA EXHIBITION.



## THE PHILADELPHIA ELECTRIC EXHIBITION.

One of the most interesting exhibits in that of the United States Electric Lighting Company, who exclusively adapted the various inventions of Mr. Edward Weston. We have already published particulars of the Weston dynamo machine and are happy to find that these have, every, undergone considerable change and the standard western use is now quite unlike those of a year ago. The Weston dynamo machine, shown by a side view in Fig. 1, has circular field magnets in the smaller size which the larger has oval, as represented in Fig. 2, which shows an end view of the most recent type for incandescent lights. The dynamo machine is strongly built and stiffened with a wrought iron bar, the framing being bored out where it receives the two bearings to a hollow, which materially saves fitting. The current is controlled by an automatic regulator, Figs. 3 and 4, in which the an-

armature is the 200-light machines only  $\frac{1}{2}$  of an inch—and the intense magnetic field, in which it revolves as close to the poles as possible, enables the electro-motive force to be kept practically constant and independent of the changes in the external circuit. One of these dynamo works fifty of the new incandescent lamps, which are each of 125-candle nominal power; they are shown in a shadow, as shown in Fig. 4. An installation, as in America, requires, "cutting" of high power lamps has been working since lines at the Tennyson Railway Depot; they have been put in to demonstrate the superior economy this system of lighting has over the old. Already considerable rivalry exists between the advantages of the two methods of utilizing the electric light. The Edison Company states that the economy of incandescents over any is very great, and just as an example the case of a small rating forty new lamps, for which they have purchased 500 Edison

ones, then treated with sulphide of ammonium to remove the crystals, the substance thus reduced to a fine smooth surface, out of which the filament is punched with steel dies of such great accuracy that of the 500 lamps which make one score there is scarcely any variation in electrical resistance. The lamps are then cut out in a special machine, after which they are tested and fixed in the lamps, a powerful current being sent through after the vacuum has been perfected in order to disperse any gas in the filament and expand that remaining in the bulb. The light is very brilliant from these lamps, on account of the natural lustre and shape of the filament. The approximate dimensions are, for the 10-candle lamp, diameter of bulb .25 in.; by 6 in. deep; resistance, coil, 400 ohms; and for the 125-candle, diameter by 6 in. deep; resistance, 125 ohms. For street lighting the lamps are fixed on a cast iron standard

electro-magnet on the main circuit attending the armature, which is kept alive by the action of the spring S. The pulley D is rotated and causes a horizontal movement to be given to the pawls P<sup>1</sup> and P<sup>2</sup>, which act so as to lead to slip over the ratchet wheels R<sup>1</sup> and R<sup>2</sup> but should the current increase, the attraction of the armature is one of the pawls to gear into its wheel and causes a rotary movement to be given to the armature, and thus put a resistance in the circuit of the field magnets by means of the contacts J J which slide on a commutator. A movement in the reverse direction is brought about by the spring S when the current is weakened. This regulator is applied to all the machines at the Exhibition, and is far more perfect than the old form, in which the brushes were moved over the sections of the commutator.

The United States Company has a fine display of machines for incandescent lighting, one of which supplies five hundred and thirty (300) lamps on a show-board, arranged after the fashion of the old oil lamp illuminations. In our next design they are similar to those used for new lighting, but are treated with a slant of fine wire, the low resistance of the

lamps, costing merely 108 cents, as against 100 cents for the old type, which is a great saving.

The electro-motive force adapted by Mr. Weston is 500 volts, the lamps being in multiple series of four; a special resistance is inserted between each of the lamps, which is either inserted automatically or by hand, the object being to avoid extinction or destruction of these in series should an accident happen to say one or more of them. The right is another electro-magnet, which cuts out all the resistance by opening the circuit so as all four lamps are extinguished, and thus saves the power which would otherwise be wasted.

The new lamp, Fig. 6, which is adapted throughout the system, has a filament totally different to that formerly used by Maxim; it is composed of a substance called tantaleum, which is manufactured in the following manner:—The raw material is oxidized, or a species of carbonized gas-oxygen, which has long been employed as a substitute for ivory, and is often seen in various forms. It is supplied in sheets which are first split to the required thick-

ness, then treated with sulphide of ammonium to remove the crystals, the substance thus reduced to a fine smooth surface, out of which the filament is punched with steel dies of such great accuracy that of the 500 lamps which make one score there is scarcely any variation in electrical resistance. The lamps are then cut out in a special machine, after which they are tested and fixed in the lamps, a powerful current being sent through after the vacuum has been perfected in order to disperse any gas in the filament and expand that remaining in the bulb. The light is very brilliant from these lamps, on account of the natural lustre and shape of the filament. The approximate dimensions are, for the 10-candle lamp, diameter of bulb .25 in.; by 6 in. deep; resistance, coil, 400 ohms; and for the 125-candle, diameter by 6 in. deep; resistance, 125 ohms. For street lighting the lamps are fixed on a cast iron standard

insure accuracy. The Weston arc lamp has also undergone considerable alteration and has lost its original simplicity; the interior parts are shown by Fig. 11, and consist of two solenoids A and B acting on a clutch in the usual differential manner, with the addition of an automatic cut-out which comes into action should the arc

consist of a small dynamo A connected by means of a flexible shaft to the pulley D. The arrangement bears a strong resemblance to that shown by Mr. Gordon at a meeting of the Society of Telegraph Engineers last year. The United States Electric Lighting Company has taken up the manufacture of carbons on a large scale, and has



FIG. 11.

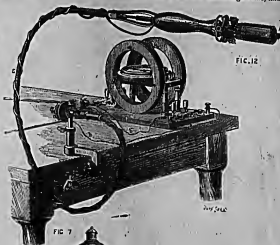


FIG. 12.



FIG. 6.



FIG. 7.



FIG. 8.

burn too long or irregularly; it also closes a by-pass circuit until the arc is struck, and prevents a bad lamp from robbing the current of the others on the series.

A very large assortment of instruments is exhibited, including a new form of Clark's standard cell; also an apparatus for exploring the strength of a magnetic field, Fig. 13, which

samples of the process in various stages, a number of motors at work driving various machine tools of Messrs. William Sellers' make; and the inevitable cascade produced by a small centrifugal coupled to a dynamo attracts great crowds to this interesting exhibit.



four for each nominal 1-horse power. The centrifugal pump, which is adopted by the engineer of the Exhibition, is 30 ft. of water per hour to the nominal horse-power, so these boilers would equal 225-horse power. The heating surface is produced by causing the fire to pass between a number of slabs consisting of spherical balls termed "units," and which are precisely the same both for the water and steam space. The construction of these units is clearly shown by reference to Fig. 1; also the method of connecting by means of a bolt, which passes through the entire length of the slab, its ends being protected from the heat by being surrounded either by steam or water, which collects in the spherical cap. The spheres are cast from 8 in. in diameter, the joint being made without red lead by simply allowing the male and female ends to bolt together, after each has been accurately turned, the small amount of leakage which occurs at first is soon taken up. A special quality of cast iron, which resembles Bessemer steel, is used for the spheres. The ordinary working pressure is from 80 lb. to 100 lb. per square inch, each unit being tested to 350 lb.

# PHILADELPHIA ELECTRICAL EXHIBITION.

This class of Mechanical Motors, which includes "steam, gas, water, heat, and wind engines," did not furnish any special novelty; besides, the three last sources of power were not represented, and the gas engines were on the well-known principles of Otto and Clerk. The largest exhibitor of steam engines was the Southwark Foundry and Machine Company, of Philadelphia, which had four Porter-Allen engines, together equal to 425-horse power, and one Southwark engine of 50-horse power and another of 100-horse power. This very fine exhibit contributed more power than was actually required, and at the same time astonished the engineer who is accustomed to rate the horse-power on a nominal basis, and who is at a loss to understand how an engine with two 18 in. cylinders and 30 in. stroke can be termed 300-horse power. The Porter-Allen type of heat-

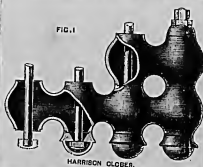


FIG. 1

HARRISON GLOBE.

zonal engine is too well known to require further description, and the Southwark only differs in the construction of the valve gear. Both these engines are very durably constructed with special attention to oiling arrangements for continuous runs without stopping; and it was intended to work the 25-horse power engine for thirty consecutive days and nights, to test its suitability as a motor for an electrical supply station. These engines took steam from a common pipe, which was supplied by the Root, Babcock and Wilcox, and Harrison boilers, which are all of the sectional type, and represent the practice which is now general throughout the United States of employing this class of boiler in preference to the Cornish or locomotive and other allied forms. The Root boiler is well known, and the Edison installations of the electric light on the Holborn Viaduct and elsewhere have made us familiar with the Babcock, which has been described in connection with the Edison system. The Harrison boiler was first introduced some twenty years ago both in the United States and England, and American boilers on this principle are said to have been working satisfactorily for that period, but those boilers failed which were manufactured in this country, probably because the cast iron employed was inferior to that obtainable in America. It has recently been introduced by a Philadelphia firm, who exhibited two boilers set together and equalling 160-horse power, on the basis of evaporating 40 lb. of water into dry steam per

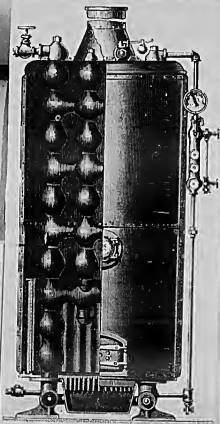


Fig. 2—VERTICAL HARRISON BOILER.

before leaving the works. An experiment was made to ascertain the ultimate pressure required to break these spheres by means of the hydraulic jump, the results being that a four-ball unit burst with 1400 lb. on the square inch, and a two-ball with 2200 lb. A special advantage of this description of boiler is the ease with which it can be enlarged so as to furnish steam for additional power; for instance one set of units termed a slab, is equal to 61-horse power, and the number of slabs can be considerably increased without interfering with the action

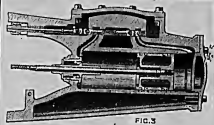


FIG. 3

STRAIGHT LINE ENGINE CYLINDER.

of the boiler. A vertical form on the same principle is illustrated by Fig. 2. In this design the slabs are connected together and supported on the two hollow feet forming mud drains, which, being below the grate, are always accessible, and enable the sediment to be easily removed. The shell of the boiler is enclosed by a sheet iron casing made in halves and connected by bolts through angle iron at the sides, so that it can easily be removed for cleaning or examining the slabs. This vertical boiler was used to furnish steam for the Brotherhood three-cylinder engine, which drove the dynamo machine for the naval search light.

We have recently illustrated and described the general arrangement of the straight line engine, and now







are led in the usual manner. Afterwards the pipe is filled up with mineral oil, which spreads itself between the horizontals of the wires and effectually insulates them. Any leakage is provided for by having a tank at one end of the line at such an elevation as is necessary to produce a small head of oil. The conductor brought into the Exhibition building is a pipe, which carries off the

Morse circuits and seven telephone circuits a distance of eight miles to the branch station at the Pennsylvania Railway. Correspondence can be carried on with this station by means of a telephone on the Exhibition stand. The wire from induction caused by the Morse circuits is very small. Fig. 1 shows a junction box with the hand holes and outlets for taking wires into adjoining buildings; a similar tube would be used for the electric light wires. The Braze system would require several pipes to accommodate all the overhead wires which at present adorn the side walk of most American cities, and in some instances it may be necessary to build a tunnel for the telegraph and telephone wires for a large number of wires by erecting a conduit of terra-cotta composed of quarter sections joined by the same material, as a foundation. The interior is fitted with

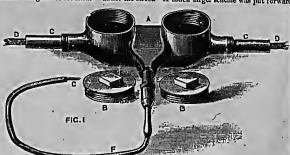


FIG. 1

by the Continental Underground Cable Company, which proposes laying the telegraph and telephone wires quite separate from the electric light cables. For this form a brick conduit is recommended, in which at intervals are

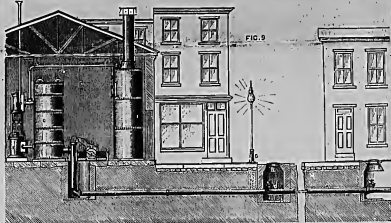


CONTINENTAL CABLE COMPANY'S MAIN SUPPORTS.

thin frames which clamp plates of some suitable hardening material, which are perforated with holes of various sizes suited to the gauge of wire to be used. In the section exhibited the insulator was a slab of glass, and suggested an easy plan to neutralize the effect of induction with telephone wires, by causing them to be laid so as to cross slightly point each other for which purpose the holes in the glass could be numbered to assist the threading of the



CONTINENTAL CABLE COMPANY'S MAIN SUPPORTS.—placed uprights B, Fig. 7, which support the circular duct iron pockets A, which extend from one manhole to the next, and secure a perfectly smooth surface. The wires



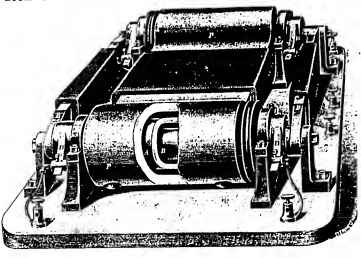
CONTINENTAL CABLE COMPANY'S METHOD OF KEEPING MAINS DRY.

wires in the most suitable direction. The American National Electric Underground Company exhibited a full-sized conduit of cast iron, similar to that which has been laid down on Chestnut street, Philadelphia for more than a year, in order to carry the electric wires used for street lighting. The objection to this system would be the great cost of such a conduit. The object is designed so that it can be opened at any part in order to get at the wires, which rest on the bottom and on a tray above. A plan which has the advantage of accessibility without disturbing the street is that shown by Mr. James Woodward; and although the idea of utilizing the kerbstones is not altogether new, this arrangement has good points. Figs. 2 and 3, p. 318,

are either drawn through by hand or by the use of a small electro-motor C, which runs on rails B, Fig. 8, and to which by means of a screw arm F the ends attached to the wires are fastened. The inside measurement of a conduit suitable for 2000 wires is said to be 1 ft. 11 in. by 2 ft. 3 in. Underground electric light wires have been strenuously opposed on account of the tendency to leakage in damp weather, and consequent loss of tension. To obviate this the Continental Company proposes keeping the air in the conduit or tube under considerable pressure and perfectly dry, and in order to do so it would be necessary to erect an air pump and force the air through a dryer. The arrangement as applied to a lighting station is shown by Fig. 9; the street

manholes are necessarily fitted with air-tight lids. This is not the first time a system of air-drying has been recommended; but it appears to us that much simpler methods might be adopted, and the air kept in a sufficiently dry condition by passing some moisture-extracting chemical in the manhole, and by means of a natural draught causing a slow circulation of the air through the tube.

## THE DELAFIELD DYNAMO ELECTRIC MACHINE.



THE PHILADELPHIA ELECTRICAL EXHIBITION.—No. XII.

By C. H. WOODWARD, Boston.  
THE DELAFIELD PIPE DYNAMO.

The Delafield pipe dynamo is constructed for electric-lighting purposes and presents unusual novelties in design. There are two armatures consisting of copper plates revolving upon their axes between the poles of two magnets. In the above illustration, one magnet is shown with twelve pole-pieces, the other magnet is in the form of a parallel-plate armature with pole-pieces from the support upon which the copper plate revolves. This armature is of course insulated from the magnets by means of hard rubber bushings around the periphery of the pole-pieces of the inner magnet where the journals of the armature are placed. The field coils are in slant, and those on the magnet P are wound in the opposite direction from those on the magnet M, so that pole-pieces of opposite magnetic polarity are on each side of the copper tube forming the armature. There are no commutators, and the current is collected by brushes D D D D applied directly at the ends of the armatures.

The electric force, as the machine is run, is said to be 1.2 volts, and the resistance of the copper pipes serving as armatures .000018 ohm.

## DISSEMINATION Wires.

There is a widespread feeling of opposition to the use of aerial wires in cities, and several city governments, with all the intemperance of ignorance characteristic of practical politicians, have decreed that the wires must be buried—at some specified time. In the present state of the art of supplying are lights from central stations at scattered points, the measure is simply prohibitory. The telephone companies have encountered their least forces upon this problem with indifferent success; and the telegraph companies will have to exercise their present facility of looking out for themselves should an attempt be made to force their wires underground in cities.

The clothes-line system of overhead wires adds no luster to the landscape, but that is no valid reason for their abolition. The few instances where low wires interfered with holders of the first department might have been avoided; and as to individual peril, a human working on an overhead wire system is in infinitely greater danger from gravity than from electricity.

As far as the public represents the interests of American underwriters in this matter, he would protest against any serious action tending to put conductors of electric are lighting systems underground, as being a measure liable to produce the most serious results in fire risk of property. Most of the fires from are lighting systems have occurred in places where the current was diverted

from the main circuit by two contacts, one of these being a ground which had existed for an unknown time, and the second and accidental contact, being another ground of sufficiently high resistance to convert electric energy into heat whose temperature was high enough to ignite combustible material. When the conductors are secured to elevated supports, they can easily be kept free from all such earth connection, and a casual inspection shows the places of probable difficulty by contact with other conductors. With an underground system, this danger exists everywhere in the line, and is difficult to locate, while the natural deterioration of material renders the hazard an increasing one. Winterer are the merits of the case, this agitation has stimulated inventors, who seem to think the digging of a trench the chief difficulty in the problem, and the protection of patent law has been invoked accordingly. They were in full force at the Exhibition with "an induction," "counter induction," and "anti-induction" devices, none of which embodied any electrical principle, or in all probability were ever put to any extensive practical test.

One of these conductors was made of polished copper about 1/4 in. thick, and contained transverse partitions of thick glass, about 10 ft. apart, pierced with holes which constituted an excellent device for securing the insulation from the wires. This is organized on the Helmholtz and Peltier principles, because one laid any changes in the wires would be out of the question. In another system the wires are laid on curved pieces of carbonaceous supported on brackets cast against the sides of the conduit, affording an opportunity for condensation to increase the leakage to a great extent. Pipes are laid to draw the wires through the conduit, with somewhat less certainty of destructive abrasion than in the scheme with the glass disk-partition.

Another exhibit showed the method of using hollow cast-iron curbs for the sidewalk, with the wires laid in brackets of pottery fastened to the bottom and sides of the iron trough. One contributor proposed to cover the wires with an insulating covering plate with copper on the outside, connected to the earth, forming an "anti-induction" covering.

There is no example of placing the wires on insulating supports in large buildings, which method appears to lack the stimulus of a patent. In criticizing some features of devices for underground electric are currents, we mention has been made of the excessive cost of such conductors.

Fire alarm circuits have been successfully conducted underground in some of our cities for many years, and other apparatus using galvanic currents also operated through underground conductors in exceptional instances. With the cheaper method of aerial wires, electric are lighting systems have been remarkably profitable enterprises, and the enforcement of any law compelling underground conductors would oblige them to stop operations,

and thereby limit the use of are lights to isolated plants.

There has not been up to the present time, except in minor, any electrical are-lighting circuits in use in the United States, where the conductors lay beneath the surface for a long distance. The matter is being tried in the city of Washington, where it was forgotten to place the wires when the conduit was being laid, and at last accounts the terms was to decide who should pay the cost of opening the conduit and laying the wires, which should have been put in while the conduit was under construction.

## NOTES

## ROYAL INSTITUTION LECTURES.

The Christmas course of lectures at the Royal Institution will be given this year by Professor Tyndall on the Sources of Electricity. The first lecture will deal with the development of electricity in frictional machines, in the static battery, in the thermoelectric pile, and in magnetic and dynamo machines. It is obvious that such a subject is rich in experimental demonstration, and may easily be adapted to the attainments of a juvenile audience, as is required by the time-honored custom of the Institution. The syllabus of subjects to be treated before Easter contains four lectures on Magnetism, by Dr. Gause; three on the Scale on which Nature Works, by Professor Johnstone Stoney; five on the Structure and Life History of Crustal Animals, by Professor Huxley; eleven on the New Chemistry, by Professor Huxley; and two on Museum and Natural Education, by Professor Sidney Gildersleeve. The course will also be given on Greek Sculpture, by C. Waldstein; and five on the Life, Theory, and Work of Richard Wagner.

## THE HYPNOSCOPIC.

Sir William Thompson, in a lecture to the Midland Institute delivered last month, gave us the gist of his generalized knowledge, pointed to the possibility of a magnetic sense, which might give a sensation of magnetism, and would be a source of power of heat, force, and so on. Some afterwards Professor W. F. Barrett recounted some experiments which came under his notice, and which showed that persons who were capable of feeling the presence of magnetism as developed by the use of a powerful electro-magnet. Dr. J. D. McWhorter has investigated the subject still further, and observed that all persons sensitive to the magnet are hypersensitive in a corresponding degree. In studying the matter he used an instrument termed a hypnoscopia, which is simply a tubular magnet shunt up the side, the edges of the film forming the poles, which are preserved by an oblong armature. Such an apparatus used only the four conductors in diameter and 5 or 6 centimeters long, weighing 1.00 to 2.00 grammes. Made of Alvar, steel, it is very strongly magnetic, and will sustain twenty-five times its own weight. It applied as follows: After the armature is drawn off, the index finger of the person to be tested is thrust into the tube of the hypnoscopia in such a way that the latter hangs from the finger by its poles, which are connected through the finger. After two minutes the magnet is drawn off and the finger examined. Dr. McWhorter states, of a hundred persons chosen at hazard, and examined in this way, actively will observe no change, but thirty will experience changes of two or three subjective and objective. For example, 20 per cent. declare they feel a prickling sensation as if needles contacted the skin. 17 per cent. would alter a sensation of heat and dryness. These two sensations may coexist, one being felt in the right arm, and the other in the left. The cold resembles that felt in front of an electrostatic machine. Some 8 per cent. of the total will probably feel disagreeable sensations and a sense of uneasiness, sometimes of swelling, heaviness of the hand, and irresistible attraction. The objective changes are either involuntary or voluntary. The involuntary (unwilled), contraction of the muscles. These changes disappear after a few minutes by light friction, but without that will persist some minutes, or even hours. The effects of this class can be hypnotized in a single session. Wherever these effects are really magnetic, Dr. McWhorter does not explain all. It is only the substitution of another action so feeble from a physical point of view that they are made credible by our instruments of research. What

method to be of the light reflected, which agrees well with the prior value. The experiments led M. Violle to the conclusion that the platinum at its fusing point fulfils the conditions requisite in an absolute standard of light, resting as it does on a definite physical phenomenon. The standard chosen is readily comparable with existing standards, and the unit can be multiplied by increasing the surface in fusion.

*The Engineer, Oct. 17/84*

**THE PHILADELPHIA EXHIBITION.**—The preliminary arrangements for the Boston Exhibition are progressing. The officers have been appointed, an advisory board formed, and electrical people met. It will be held in the building of the Massachusetts Charitable Association, and continues about five weeks. Goods will be received between the 5th and 15th of November. It follows very closely upon the Philadelphia Exhibition, and must necessarily, if these conditions can be made commercially successful, be in many respects, on a duplicate of that, if the display be complete, scarcely possible that there will be too many of them, for the reason that it is probably the most effective manner in which the public can be made familiar with the various electrical appliances. The business is already propelled in certain directions by reason of popular ignorance of the subject, and if there are those who still believe that human profits are realized in every branch of it, they may learn by examination of various exhibits that considerable sums of money may be invested before any return are secured. How far the general public will appreciate a technical exhibition of this kind, depends upon its attractiveness, the character of the people in the vicinity of its location, and the price of admission.

# THE PHILADELPHIA ELECTRICAL EXHIBITION—No. XIII.

By G. J. H. WOODBURY, Boston.

THE WESTERN ELECTRIC LAMP COMPANY'S EXHIBIT.

THE exhibit of the Western Electric Company of New York, Boston, and Chicago, was a realisation of the romance of the telephone. These large establishments represent one of the commercial features of the telephone. Not many years ago, Professor Bell found in Mr. Charles Williams, Jun., of Boston, a man who possessed the skill necessary to prepare the telephone for commercial application, and also sufficient foresight to perceive the possibilities of the invention and have faith in its success. The Bell telephone have always been made in the electrical instrument factory of Mr. Williams, and the Western Electric Company represents a union of this establishment with two others at Chicago and New York, for the manufacture of telephone supplies and other electrical appliances. The switchboard is the most important of the tributary inventions brought out by the telephone. Without it telephonic intercourse would have been limited to isolated lines and the central station system impossible.

The Western electric switchboard for large central stations of telephone companies enables any operator to make a connection properly between any two persons in any office of 4000 subscribers without leaving her chair. This form of switchboard has been in practical use in some of the large cities in the United States, and the only portion of the apparatus which appears to be liable to derangement is the connecting cords, which will, as the result of long use, break in hidden places. This, however, is not a sufficient defect to counterbalance its other advantages; and it could be diminished by occasional testing of these cords for increase in resistance, and thus make repairs before actual breakages occur.

For smaller stations limited to 500 subscribers, the Williams switchboard in this exhibit is more simple in its construction, and not liable to get out of order. The illustration shows the brass pins on the front row A, which are used to make the connections by pushing them through the brass strips which run across the board. This method of connection limits the communication to one pair of subscribers at a time on the same strip.

The various switchboards in a telephone station are lettered, Fig. 1 representing switchboard A, and the letters at the sides represent the other switchboards in the room, which can be thrown in the circuit when subscribers whose wires enter on different boards, wish to be placed into communication with each other. When a subscriber calls to the central office, the act of ringing the bell also causes one of the drops D to fall and attract the operator. During an electric storm last year, the earth's polarity kept these drops up, so that there was no communication with central office. The duration of this storm was variable in different places in the eastern portion of the United States. The "generators" as the alternating current machines are termed, were run at the exhibition by a small dynamometer near the switchboard. Generally a water motor is used. This exhibit also contained a full line of the supplies used by telephone and telegraph companies, including some fine examples of testing instruments. Among the insulated copper wire were cables made for underground and for aerial purposes, and containing from 5 to 100 conducting wires each. This insulation is paraffin, and the whole garment is surrounded by lead. It is claimed that as a matter of experience, the use of paraffin renders the static capacity of these cables lower than any other insulator, and thereby avoids to a large extent the retardation consequent on the static charge, which is often a serious difficulty in the use of cables for telephonic purposes.



## LITERATURE.

*Turning and Mechanical Manipulation introduced as a Work of General Interest and Practical Instruction on the Lathe, and the various Mechanical Processes followed by the Amateur.* Vol. V. *The Principles and Practice of Graining or Complex Turning.* By JOHN JACOB HOLTZAPFEL. London: H. K. Lewis and Co. (Price 30s.) This instructive mechanical treatise follows the same plan as the first volume, and is equally well adapted to the amateur who can boast of a regular training in the use of tools. But it must be remembered that the work was written by an amateur, and not for the sake of gain. It might even be an amateur and a professional at the same time, for it would be any to adduce endless examples of men to whom the calling which they followed for a livelihood was not every minute of their waking time, and was the source of all their pleasure, hope, and fears. And in no class is this more true than among mechanics. There must be few of our readers who any wide professional acquaintance, who do not know many men whose whole lives are engaged in mechanical matters, and who when business is disposed of, instead of seeking recreation in other directions, prefer to sit and scheme, or to spend the time in "talking shop" with kindred spirits, not with any aim at the acquisition of their knowledge and to their power of making money, but because machinery is a never failing source of pleasure to them.

It is to such amateurs as these that the book before us is addressed, and not to those who regard it as an agreeable pastime by the aid of which they can gain a little cheap applause from those who do not know the difference between good and bad work. There exists in this country a very numerous class of men whose nature inclined for engineering, but who by the pursuit of one of the other pursuits. So large is this class that it has a literature of its own, and manufacturers whose chief business it is to supply its wants. Among these latter the firm of Holtzapfel and Co. has long been celebrated, and the work of the house has now published the fifth volume of an exhaustive work dealing with the mechanical operations which lie within the scope of the class we are considering. This volume relates to the principles and practice of ornamental turning, and the most curious inspection shows that the kind of work it describes can only be effected by an amount of patience, skill, and dexterity which are scarcely to be found in the present generation of regular mechanics educated under a system of division of labour. The man who can produce some of the objects which form the subjects of the illustrations can call himself a craftsman without fear of contradiction.

In these days when there is a special tool for every operation, the scope of the lathe has been very narrowly circumscribed, and it is only when we go to the workshop of the amateur that we realize how many uses it can be made to fulfil. It is not only useful for the production of cylindrical forms, but it also acts as a drilling machine, a planing machine, a grooving machine, and a mauling machine, indeed there is scarcely any pattern of work which it cannot produce, with the aid of the various chucks and appliances which form part of its equipment. The volume before us is devoted to the description of the various appliances which can be effected in the lathe, the reader being supposed to understand, either from the preceding volume or from other sources, the ordinary methods of hand turning. It describes the forms of the most general cutting frames and chucks, and the operations that can be effected by them, beginning with the simple and proceeding to the more complicated, and illustrating every value being introduced, except the geometric chuck and the rose engine, both of which, for a long space, are held over for the present, and will appear in the next volume.

The present work commences, after a few introductory pages upon materials suitable to be turned, and the cutting tools for the purpose, with a chapter on slide rests, in which it describes the usual methods of turning plain and ornamental work with a fixed tool. It next deals with additions to the slide rest, such as the compound gauges on the slide rest, and the various gauges on the tool rest, and also gives a method of determining the length of the traverse, the cradle to place the slide rest at a given angle either for turning or sliding, the counting rack to effect the accurate traverse of the tool to

definite distances between the main slide for many repetitions of a cut, and to avoid the necessity of constantly inspecting the divisions of the micrometer on the main screw, and various forms of automatic gear, other than the main gear, for moving the tool along the work at a uniform speed. After the tooling for the work at a uniform speed, the book proceeds to turning curves by means of templates out to the desired extent, and fixed as to the position of the rest, and the next section describes various devices for driving revolving tools mounted on the rest. The next chapter is devoted to reversing the tool, and to cutting circles, such as the vertical, the horizontal, the universal and internal cutting frames, which any rotary object carried in holders on the lathe can be set upon to cut any lineary work carried between the centre or on shafts. The work can be moved from time to time through given angular distances by means of the dividing pinion on the headstock, and very complex and beautiful forms are produced by these simple means. Drilling, fluting, and perforating tools follow, and the last set of simple appliances with which every mechanic is supposed to be familiar, but the full scope of which few are acquainted with. Each division of the book is illustrated by extensive engravings, showing actual objects produced by the means which form the subject of the chapter, and demonstrating the economy of the methods which follow the judicious repetition of simple patterns.

The remainder of the volume deals with matters which are generally considered outside the province of the engineer, unless he is also an amateur of the art of turning. The oblique cutting frame, the cycloidal cutting frame, and the rose cutting frame occupy one chapter; eccentric and oval work another, and with the spherical chuck, the straight line chuck, and the rectilinear chuck a third. Then the work enters upon still more complex operations, and describes the effect of combining ornamental chucks, using the spherical on eccentric, eccentric on rectilinear chucks, and on the oval and eccentric chucks. It then explains compound centric turning, dividing it into odd and even compound eccentric, polygonal figures and compound eccentric patterns. Spiral turning has a chapter to itself, and the work ends by an account of the construction and manipulation of the spherical rest.

Mr. Holtzapfel is in a past master of the art at present, and writes with the clearness and precision which comes from a perfect acquaintance with his subject. It is impossible to confer manipulative skill by written instruction, but the descriptions of the apparatus and operations in this work are quite sufficient to enable a mechanic to put them into successful practice, if he has the necessary natural qualifications. For this class of work cannot be taught to every one; patience, dexterity, and delicacy of touch are original gifts, and without a plentiful supply of them it is impossible to turn the beautiful and complicated forms which Mr. Holtzapfel lays before his readers. But given the necessary natural ability and the preliminary training, all the rest may be acquired by the aid of this book, and the paths may be made to accomplish wonders of which the ordinary turner has no conception. The volume is complete in itself, and should be in the hands of every one who regards the art as an art, not only a business, but a pleasure.

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feelings now adapted with so much pride by Woolley is really obsolete. It was anticipated, however, by Mr. Campbell Bannerman, when dealing with the Navy Estimates, that a 63-ton gun of steel would pass from eighteen months to two years to come into use, and he asserts confidently that a 63-ton gun of the new type could be made in less than three months. The cost of a 63-ton gun of steel construction he puts down at 16,000*l.*, a gun of the new type, and the same size in cast-iron will cost 3000*l.* only.

The writer concludes his letter with the following appeal to the Members of Parliament:

I appeal to you more earnestly. What has it yet time, let this dangerous trial, this system full of promise, have a fair trial. But let it be tried under the direction of one who understands it, and by those who understand it, and only half believe in it. I place my knowledge unconditionally at your Lordships' disposal. With this sole assistance of Colonel Malet and the means at his command, the merits or demerits of the system could be tried at any time, and for every month. If this offer were understood it now, and only half believe in it, and that other nations who have taken the matter up successfully, will pursue it successfully, and England will again be in the new confederacy, and in the military race.

This what was proposed in a previous article is now suggested by Mr. Langley himself, and we earnestly hope that those in authority will cast aside opinion and belief of infidelity, and give the system a fair chance under its own merits. Knowing what we do about artificial rotation and the number of conflicting elements that have to be brought together to reach the desired result, we cannot be sanguine of seeing our wishes carried out at an early date, but public opinion may prevail if persistently urged, so we appeal to those with influence to bring it to bear to support a cause which we are sure will redound to the benefit of England.

#### THE WEATHER OF OCTOBER, 1884.

The weather in the British Isles during October has been very changeable, though the rainfall has been below the average, and on the whole the temperature has been reasonable. Referring to extreme positions to which the Isle of Man is exposed, the mean atmospheric pressure and temperature were as follows:

Position.	Mean Pressure.	Difference from Normal.	Mean Temperature.	Difference from Normal.
	in.	in.	°C.	°C.
North ..	30.70	above 0.60	62	above 2
North ..	30.14	below 0.02	62	above 1
West ..	30.05	below 0.07	61	above 1
West ..	30.07	below 0.05	61	above 1
Central ..	30.03	below 0.01	61	above 1

The distribution of rain, in amount and frequency, may be roughly represented by the following results:

Places.	Daily Days.	Amount.	Difference from Normal.
		in.	in.
Birmingham ..	20	1.10	above 0.05
Bristol ..	20	1.10	above 0.05
Cardiff ..	20	1.10	above 0.05
Exeter ..	20	1.10	above 0.05
London ..	20	1.10	above 0.05
Manchester ..	20	1.10	above 0.05
Yarmouth ..	20	1.10	above 0.05

Atmospheric pressure was much above the normal value, and the excess was greatest in the north, west, and central districts. Those are the districts which had reasonable mean temperature, and rainfall much below the average. In the north, temperature was above the normal. In the south, the rainfall exceeded the average, but this was due to the exceptionally large fall on the 11th. In several cases with the mean distribution of barometrical pressure, the result of the daily general direction of the winds is W.N.W. The seasonal rainfall being S.W. The barometrical column ranged between 30.7 on the 6th and 28.6 on the 29th, the least it was at the latter date. The highest temperature, 65 deg., occurred at Leicester on the 10th; the lowest, 35 deg., at Cambridge on the 14th. A fall of 3.22 in. was measured at Yarmouth on the 11th and 1.02 in. at Leeds on the 29th. On the 8th, 8 a.m., a cyclonic storm came from the south of the Hebrides, and travelling S.S.E., reached the entrance to the Bristol Channel next morning, and progressed to the Helles and Denmark straits,

the succeeding two days. A thunderstorm occurred at Oxford on the 9th, and lightning was reported the next day in south-west England. During the night of the 26th and 27th a deep cyclonic storm centre gave to those islands generally a severe north-westerly storm. During the night of the 28th and 29th, a severe north-easterly storm centre came from the south of the Hebrides, and travelling S.S.E., reached the entrance to the Bristol Channel next morning, and progressed to the Helles and Denmark straits, the succeeding two days. A thunderstorm occurred at Oxford on the 9th, and lightning was reported the next day in south-west England. During the night of the 26th and 27th a deep cyclonic storm centre gave to those islands generally a severe north-westerly storm. During the night of the 28th and 29th, a severe north-easterly storm centre came from the south of the Hebrides, and travelling S.S.E., reached the entrance to the Bristol Channel next morning, and progressed to the Helles and Denmark straits,

the main circuit. Smaller dynamos of this system would find coils, with the purpose of rendering them self-acting.

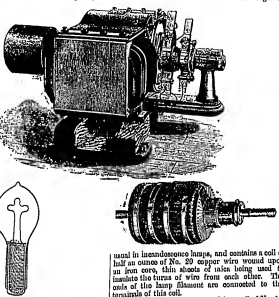
The manner in which are governed by an electromotor in a manner which is new to the United States, although possessing some points in common with the arrangement invented for this purpose by the late Mr. J. B. Sturges. The centre of the armature is a magnet, which revolves upon the screw forming the lamp rod, and the rotation of the armature causes the horizontal diameter of the coil to move the carbon core radially the length of an inch. The bobbin on this armature are double wound in reverse directions, the inner fine winding being in series, while the outer coarse winding is in parallel circuit. When the carbon core is near each other, the current through the coarse winding causes the armature to revolve in such a direction that the distance between the carbon is increased. On the other hand, should the armature move too far, the current in the fine winding is increased, the increase of current in the fine winding would tend to move the armature in a contrary direction and move the carbon towards each other.

This company also have another lamp regulated by differential magnets. This system belongs to the low-tension class of arc lamp, and its soft light renders it peculiarly adapted to photographic purposes. It is originally used in western cities of the United States for such work. The light is thrown by a mirror against a concave reflecting surface, and the light is of a fine quality, and is white as well as brilliant. Screens of this pattern are made of brass, and are used by the photographers to obtain clear pictures of objects. The light is also used for printing and copying photographs.

#### THE DIETAL INCANDESCENCE LAMP.

An incandescent lamp completely sealed, without the use of a glass globe, or other artificial coating through the glass bulb, might at first be deemed an impossibility, and, after explanation, must be admitted to be a certainty. Such is the Dietal Incandescence Lamp.

The lower neck of the bulb is rather longer than



used in incandescence lamps, and contains a coil of half an ounce of No. 22 copper wire wound upon an iron core, this coil of wire being used to insulate the turns of wire from each other. The ends of the lamp filament are connected to the terminals of this coil.

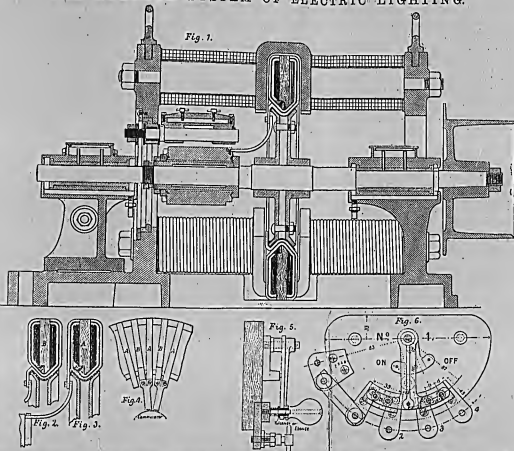
The neck of the lamp is placed in a coil of No. 14 wire, which is connected to the dynamo circuit in such a manner that the dynamo generates a direct current of a few amperes, with 7000 turns per minute, renders it an intermittent current, and the secondary current induced in the coil of the lamp filament is connected to the terminals of the lamp.

A unique method is used to obtain constant current in the dynamo of between twenty and forty-light amperes, by using a compound wound armature with two sets of commutators. A portion of the brushes are connected to the smaller commutator, and the current is used only for the field coils; the remainder of the brushes are connected to the larger commutator, which delivers the current to





## THE GULCHER SYSTEM OF ELECTRIC LIGHTING.



## ELECTRIC LIGHTING AT THE INTERNATIONAL HEALTH EXHIBITION.

No. XI.

The Eastern Gallery, the Chinese Court, and the Dairies were illuminated by the Gulcher Electric Light Company, of Detroit, Mich., U.S.A. The current was supplied by eight Gulcher dynamos, of the size known as No. 4, and was utilized in 50 arc lamps and 500 Crookes' incandescence lamps, the whole arranged in parallel arc. It will be scarcely necessary to remind our readers that the Gulcher Company was the first, and for a long time the only firm, which used arc lamps in this way, and this arrangement has always been the feature which has distinguished their system from all others. The advantages which accrue from it are self-evident and simplicity in the connections. Assuming the electromotive force necessary to maintain an arc to be 60 volts, it follows that when the lamps are in parallel arc, the potential in the leads need not exceed this figure, and consequently it is below the point at which it can be perceived by the sense of touch. But if the lamps are in series, or with most other systems, there must be 60 volts for each arc. Thus twenty lamps require a current having an electromotive force of 1200 volts, a potential which is dangerous, if not fatal, if passed through the human body. The safety of the Gulcher method of working involves the disadvantage of requiring large condensers to carry the current, which, on widely extended circuits, such as those employed in street lighting, may be a serious consideration, but is not of much moment in smaller installations, as, for instance, in buildings and workshops.

The eight dynamos were divided into two groups of four each. One set was compound wound and fed 350 incandescence lamps in the dairies, the electromotive force at the terminals being 106 volts. The other set was series wound and supplied 50 arc lamps of 500 actual candle-power in the Eastern Gallery and Chinese Court, and 138 incandescence lamps and eight arc lamps in the Chinese restaurant. Throughout the Chinese section the lamps were inclosed in Chinese lanterns, and a very artistic effect, thoroughly in keeping with the decorative style of the building, was obtained. The current from this set of machines had an electromotive force of 70 volts, the magnets of each machine being excited by the current from the adjoining set. If one dynamo could be instantly cut out of circuit without in any way interrupting the current or the light, the plan followed being to have one generator serve that was required, ready for an emergency, and the set cash in turn set as the reserve, so that all go on the same amount of work. This was effected by means of a novel form of switch, illustrated in Figs. 5 and 6, which show the switch in front and side view. Fig. 7 is a diagram of connection for four dynamos. The switch has four terminals marked 1, 2, 3, and 4. The first, No. 1, is fixed in two parts connected by a strip of lead which is movable portion carries two insulated connections and can be placed in either of two positions as shown in the figure, one connecting piece together the terminals 1 and 2, and the other terminals 3 and 4. In the neutral position between, No. 2 is insulated, No. 3 and No. 4 are connected, and No. 4 is insulated. The positive brush of each dynamo is coupled to No. 1 terminal

the negative brush, to the negative main lead, which is shown by the external circle in Fig. 7. One end of the magnet coil is coupled to the switch terminal No. 4, and the other to the positive lead, shown by the middle circle in Fig. 7. Now supposing the switch handle to be in the position shown in Fig. 6, the course of the current is from the positive brush to No. 1 terminal, thence to No. 2, and along the centre circle (Fig. 7) to



No. 3 terminal of the next switch. Then it passes through the field magnet coils of the adjoining dynamo to the positive lead, and through the lamps to the negative lead and the negative brush. Thus each machine is excited by the current from the adjoining machine.

Suppose it is desired to cut one of the generators out of circuit, say the upper one in Fig. 7, the switch is put into the "off" position, breaking the connection between 1 and 2, and between 3 and 4, connection between 1 and 2, and between 3 and 4, and isolating 3 and 4. By this the positive brush is separated from the inner circle, and there is no

















#### Scrapbook (Canvassing Reports)

This scrapbook covers the period September-November 1884. It contains correspondence from Alfred O. Tate to Charles Batchelor relating to the canvassing of prospective towns in Michigan and Canada for the installation of central stations. Included are Battle Creek, Detroit, Grand Rapids, Lansing, Montreal, Ottawa, and Quebec City. The letters also discuss the local agent appointed by Tate for each locality as well as local economic conditions. The front cover is labeled "Tate." The spine is stamped "Invoice." The book contains approximately 35 pages, some of which are numbered, and an index. The pages have been cut out of the book.

A Harris. D. 19.

A  
B  
C

Brantford, O. P. Cameron. b. 2. 3.

Bay City. N. Bay City Mich. 13. 14

B. J. Rapids. Mich. 18

B Bullard. E. A. Tassan Mich. 9  
Bailey. J. E. 10,  
Brown. J. J. 3  
Burke. H. J. 18

Coldwater Mich. 22

C Cameron Edw. Brantford. O. 203  
Cardman. b. E. 10  
Chandler A. C. 22.

Stroh, Neck 10.

D Walzel. A. K. Larina O. 7.

D  
E  
F

E

Stroh, Neck 15

F

Pickel, John A. Fels, etc.

Grand Rapids Mich. 18  
Grand Haven Mich 19

G. M. Sargent 13, 14  
H. J. Grant 0

Holly, Mich. 12  
Hamilton, O. 0

H. J. Hoopeslock Ont. 1, 3.  
Holden, O. 17.  
H. J. Grant 20  
Hall 1

Ingersoll, Ont. 5

I

J. L. Jackson 15. 16.

H. King. A. S. 12.

J.  
K  
L

London O. 4  
Lapen. Mich. 9  
Ludington. Mich. 16.

L

W. H. Clements Mich. 5  
Michigan Milk Cond. 10  
Bancroft, Mich. 17  
Horsegon. Mich. 17

M. W. Hutton 21  
Harrison 22

W. H. 20

M. H. J. A. London O. 4  
Hudson, H. Strathairn Ont. 6.  
H. H. 12.  
H. H. Bros. 18

Orosco. Mich. 16

M  
M  
O

June Oct. 10. Fisher 1  
Port Haven Mich. 8  
Portae 12  
Petersborough Nov. 20

Spofford Jan. 19

Red City. Mich. 17

Spaulding Oct. 6  
Sarnia  
Saginaw Mich. 7 1/2  
Ettinger. March 22

Spaulding. E. & Port Haven Mich. 7

S

Pat. R. S. 20

Pitua Ab. 21

Vassar, Mich 9

V

Woodstock, Ont; J. Merrill 1.  
Windsor Ont "

W Wilson to. C. L. Ingersoll Ont. 5



Hydrocell Oct. 24, 1904

Edison Clark Wks  
New York

1093  
11  
Sirs: Subject to your approval I have  
appointed

John Hall

Agent

Woodstock, Ontario

Terms of the insurance sales

Insurance Agent in Charge of Great  
North Western Telegraph Office

Was highly recommended by the Member of Parliament  
for this County. Has much influence with  
Town Council and leading spirits of the town.  
Woodstock: Pop. 7500. Two or three  
mills. One of the best towns in Western  
Ontario. Quite hot with gas. No  
Electric Light ever introduced but people  
anxious to get it. Agent will devote his  
energy to formation of stock company.

Yours truly

John Hall

Hydrocell Oct. 24, 1904

Edison Clark Wks  
New York

1093  
11  
Sirs: Subject to your approval I have  
appointed

John H. Fisher

Agent

Paris, Ontario

Terms: 5% on Gross Sales

Investment occupation

Accountants, Insurance, Insurance Agt.  
Secretary of the Board of Trade.

Paris has population 4000. Contains  
number of cotton mills and Carpet factory.  
Some time ago the town council was asked to  
adopt Elec. Light for street illumination but  
refused. Many dissatisfaction among the  
residents. Board of Trade will soon pass a  
resolution and petition Council to get Elec.  
Light. If this fails Agent will try to form Street Lighting  
Company.

Yours truly

John H. Fisher



Brantford has pop. of 10,000.  
 Number of Mills & Factories -  
 Our Agent states that many  
 merchants anxious to get Electric  
 Light - He will attempt to form  
 Company at once - No Electric  
 Light has been introduced here  
 yet. - Yours truly

*[Signature]*

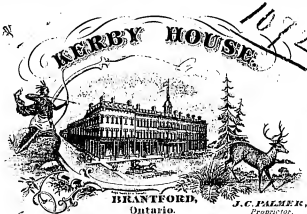


1089  
 Sep 27/84  
 Edwin Blackwelder  
 New York  
 Sir:  
 Subject to your approval  
 I have appointed  
Edwin Cameron  
 Agent for Brantford Ont  
 Present occupation:  
 Manager Montreal Western  
 Telegraph Company (St. Rob. B.)



of Boston are at present installing an arc light plant on their own hook. Their scheme is to run it for a while and then sell out to a company formed locally. We intend our agent to watch them closely. To profit by any organization they might form, and when the proper time comes - before any sale is effected, to get in a bid. He understands thoroughly what he has to do.

Yours truly



Chas Batchelor Esq  
New York

Dear Sir: Subject to your approval I have appointed

C. J. Grawt

Agent for Hamilton Ont

Present occupation:-

General Ticket agent Grand Line and several lines of Railway also Treasurer Hamilton Free Trade Co. Has excellent connections for business. Hamilton has a population of about 32,000 - large rolling Mills and Foundries. The Royal Electric Co

I shall therefore 'play the limits' as regards Agents' Commissions as I desire to secure their co-operation to the fullest possible extent.

I trust that the estimate lists are nearing completion as an agent who cannot quote prices, is of course handicapped, and I cannot do much business until these are distributed.

Yours truly,



Highsoll Oct

Sep 29<sup>th</sup> 1892

Richard D. Webb

Chemist & Druggist  
New York

Sir,

In reporting the appointment of Agents for Stratford and Brantford, Ont., I omitted to state that my terms with them are for 5% on the gross sale.

I intend to have every town under my control worked for all it is worth, and although I have made three appointments today, which is pretty quick work, I have exercised great care and discretion in the selection of Agents - In most cases



HERRING STREET.

Tremont House.

London Ont

1888

is being used at this intersection  
for a few of the main streets, it  
being an exhibition plant put in  
by the Ball Elec Co of Toronto,  
it will be taken out when  
the County Exhibition, now in  
progress, closes on Saturday  
next. They are not attempting  
to form a company - About six  
months ago the Gas Company  
removed their contract with  
the Municipality for lighting the  
streets for a period of five years -  
permanently

*[Signature]*



HERRING STREET.

Tremont House.

London Ont  
Sept 25 1888

Dear Mr. Mc  
New York

Dear Sir: In reply to your approval I  
have appointed  
J. A. Noble

London <sup>Agent</sup> <sup>per</sup> <sup>for</sup> <sup>the</sup> <sup>business of</sup> <sup>the</sup> <sup>Province</sup> <sup>of</sup> <sup>Ontario</sup>  
General Occupation:

General Insurance Agent  
and Secretary of the Board of Trade.

London Pop 35,000. Is the commercial  
center of Western Ontario and one of  
the finest cities in the province -  
has mills, factories, a paper & news  
business etc. - Am. exp. light



OPPOSITE NEW BATH HOUSE. | H. CORNER, Prop.

MT. CLEMENS, MICH.

Oct 24 1884

Edison & Co  
New York

I desire subject to your approval have appointed

E. A. Young

Agent for Michigan

Terms 5% Gross

Present Occupation - Druggist  
Pop 4500. Five Mills. Streets lit with  
naphtha. Agent says there has been  
decreased many parties of his acquaintance  
relative to introducing Electric Light. This  
is peculiar and will communicate with you soon  
re procuring an estimate on 40 lights.  
It would be well to anticipate him -

Travelling

*[Signature]*



Tecumseh House.

London, Ont.

Sept

1884

HEAR, WARE & CO.

Edison & Co  
New York

I desire subject to your approval I  
have appointed

E. C. Wilson

Agent for Ontario

Present Occupation:

Manager of Packing Establishment

Suggested Pop 4500. Two or three  
factories. Had town for lampery -  
Rivale Woodstock and if we get one or  
get the other. Think can set plant to the  
Packing Estab. which Wilson is Manager -

Travelling

*[Signature]*

Huron House

D. J. STEPHENSON, MANAGER.

Post Huron, Mich., ..... 1884.

surplus number of lamps that  
can be rented to private con-  
sumers, the profits on such  
surplus paying for the street  
lighting, and which latter will  
therefore cost nothing. Agent  
considered it excellent scheme and  
will use all his influence to carry out.  
He spoke of a church, with power  
close at hand, and says he can  
sell them one of our 3. lig lit  
plants. This is an enterprising  
town. Streets well paved - Building  
first class & compact.

Very truly,

*D. J. Stephenson*

Huron House

D. J. STEPHENSON, MANAGER.

Post Huron, Mich., Oct 1<sup>st</sup> 1884.

Edison Mach. Wks  
New York

Sir: Subject to your approval  
I have appointed

W. Nicholson

Agent

Skathray Ontario

Terms 5% Gross.

Present occupation: Insurance Agent &  
Member of the Town Council

Pop: 4000. No gas. Streets lit with  
coal oil which costs town about  
\$ 200. per year. In order to  
compete with this, intended  
Agent to try and sell town a plant  
of sufficient size so that when  
streets are lit there will be a

Aurora House

D. J. STEPHENSON, MANAGER.

Post Aurora, Mich., 1884.

is on the Council Committee detailed to consider proposition and will oppose it, advocating electric light. The matter however has gone so far, and local interest is identified to such extent with Gas Co. that I doubt his success so far as selling plants to town goes. If he fails will try to form company.

Authorizes this agent to work  
**Point Edward, Ontario**  
which place connects of mills - pop 1000.  
20 minutes ride from Sarnia by Stratford.

As the following place is out of the line of my present route, and as agent has business which takes him there quite often, I gave him authority to make sales in

Aurora House

D. J. STEPHENSON, MANAGER.

Post Aurora, Mich., Oct 1884.

Edison Chas. W. Co.  
New York

Sir: Subject to your approval have appointed:

A. H. Dalziel

Agent.

Sarnia Ontario

Salary \$500 Gross.

Insurance Agt. Agent Chicago & C. T. Ry. Co.

Member of Town Council

Pop. 500. Mills & Factories. Agent thinks can do good business in isolated are plants. Gas Company just starting. Mains all laid and works about completed. They have made proposition to town to give them 50 lamps @ \$20. per year each. Our Agent



# Sherman House.

OPPOSITE NEW BATH HOUSE. | H. CONNER, Prop.

MT. CLEMENS, MICH., 1884.

comprise several very important ones  
and our prospects in this town are good.  
We authorize them to act as agents for

Fort Gratiot, Michigan

Op. 3000 - Agents chiefly of the work  
Shops of the Grand Trunk Railway -  
They will also work

St. Clair, Michigan

which is a popular summer resort  
(Annapolis Springs) within easy distance of  
Detroit. They think they may be able  
to light some of the hotels -

Yours truly



# Sherman House.

OPPOSITE NEW BATH HOUSE. | H. CONNER, Prop.

MT. CLEMENS, MICH., Oct 21 / 1884

Edison Mach. Wks  
New York

Sirs:

Subject to your approval I have appointed

C. H. Spalding & Co.

Agents

St. Huron - Michigan

Terms 5% Gross

Several licenses apply to

Op. 14000. Mills and factories - Streets and  
Stores lit with Gas. An Elec Light Co.  
has already been formed and has  
obtained 20 years option on exclusive  
rights gratis. They have not yet  
adopted any light. Spalding Co  
are stock holders with the  
the personal of the above firm.

City of Vassar County of Tuscola State of Michigan (Form 6.)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, Gen'l. Manager.

Dear Sir:

Subject to your approval, I have appointed  
as your agent for

Vassar

Name C. A. Bullard  
Business Keypat & Telephone Exchange  
Address P.O.  
Terms 5% on gross sales  
Territory Town of Vassar

REMARKS:

Pop. 2000 - Some good mill  
to which (probably) plants can  
be sold -

C. A. Bullard

Gen'l. Agent.

City of Lapeer County of Lapeer State of Michigan (Form 6.)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, Gen'l. Manager.

Dear Sir:

Subject to your approval, I have appointed  
as your agent for

Lapeer

Name R. A. Tennant  
Business Dep't. Abram House  
Address as above  
Terms as with company here  
Territory town of Lapeer

REMARKS:

No mills - Town is a  
grain centre. Tennant will  
keep us posted as to any ones  
the coming in there. Do not consider  
the place worth while being a day  
in -

C. A. Bullard

Gen'l. Agent.

City of Detroit County of Wayne State of Michigan (Form 6.)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, GEN'L. MANAGER.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Detroit

Name Chas. C. Cadman  
Business Electric Light  
Address 1533 Congress St. Detroit  
Terms 5% on Gross Sales  
Territory Detroit City

REMARKS:

About every arc light on the market can be seen in operation  
in Detroit. Lower Lighting pronounced a failure.  
Cadman will devote all his time to pushing our business.  
He is an old Bank manager and has good connections  
among the business men of the city, and is an  
excellent canvasser - notwithstanding all the Ed. Light  
Co's who are operating in the city, I anticipate  
a good deal of business for us -

Chas. C. Cadman

Gen'l. Agent.

City of \_\_\_\_\_ County of \_\_\_\_\_ State of Michigan (Form 6.)

EDISON MACHINE WORKS. <sup>(B)</sup>

CHARLES BATCHELOR, GEN'L. MANAGER.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

The Upper Peninsula of Michigan

Name Chas. Bailey  
Business Electric Light (Edison)  
Address 1533 Congress St. Detroit  
Terms 5% on Gross Sales  
Territory The Upper Peninsula

REMARKS:

The Upper Peninsula is that part of the State which lies north of Lake Michigan  
and south of Lake Superior and includes the following Counties -  
Ontonagon - Newau - Noughton - Baraga - Marquette - Delta.  
Schroeder - Chippewa - Mackinac - In Peninsular.  
This is a wild region which would not repay me for the expense  
of visiting it - Bailey has an interest in mines up there and  
is going to push Electric Light. I have made the appointment  
subject to my will as regards etc.

Chas. Bailey

Gen'l. Agent.

City of Windsor County of Province of Ontario Date of Oct 21, 1884

## EDISON MACHINE WORKS

CHARLES BATCHELOR, GENL. MANAGER

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

WindsorOct 11, 1884Name, Chas. C. CadmanBusiness, Electric LightAddress, 153 Niagara St. WindsorTerms, 5% on Gross SaleTerritory, City of Windsor

## REMARKS:

Mr Cadman is well acquainted with the  
officers of the Windsor Elec Lt Comp'y  
and will watch our interests in accordance  
with the circumstances set forth in my  
letter to you of same date -  
There is a little bother about lighting,  
that he will also try & work up.

Chas. C. Cadman

Gen'l Agent.

City of Pontiac County of Oakland State of Michigan (Form A)

EDISON MACHINE WORKS

CHARLES BATCHELOR, Gen'l. Manager.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Pontiac

Name, A. I. King  
Business, Country + Machine Works  
Address, Pontiac, P.O.  
Terms, 5% on Cash Sales  
Territory, Area of Pontiac

REMARKS:

Pop. 4647 - Two or three mills - Prospects  
here for City plant are very good - Mr  
King is one of the leading men of the  
place and as soon as estimates are  
made he will push it.



Gen'l. Agent.

City of Holly County of Oakland State of Michigan (Form B)

EDISON MACHINE WORKS

CHARLES BATCHELOR, Gen'l. Manager.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Holly

Name, E. C. Stewart  
Business, Hardware, Iron, Steel & Bank  
Address, Holly, P.O.  
Terms, 5% on Cash Sales  
Territory, Area of Holly

REMARKS:

Pop. 3000 - Several mills - Could  
obtain water power for a  
town plant -



Gen'l. Agent.

City of Flint County of Genesee State of Michigan (Form 6.) 13

EDISON MACHINE WORKS.

CHARLES BACHELOR, GEN'L. MGR.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Flint

Date Oct 24 1904  
Name C. L. Brown  
Business Cashier First Nat'l Bank  
Address Flint  
Terms 5% on Gross Sales  
Territory City of Flint

REMARKS:

Pop. 8418. Only two on three mill.  
The Vandapole B'y has an arc plant of 24  
lights in operation - on stores and a few on  
the street. They have made a bid for all the  
street lighting which is being considered by the Board.  
If it is accepted they will have to increase  
to the extent of about 40 lamps and our agent  
will watch them & make bid. The above is so  
composed of local people.

*[Signature]*

Gen'l. Agent.

City of Bay City County of Bay State of Michigan (Form 6.)

EDISON MACHINE WORKS.

CHARLES BACHELOR, GEN'L. MGR.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Bay City

Date Oct 6 1904  
Name M. Garland  
Business First Standard Mfg Co  
Address Bay City  
Terms 5% on Gross Sales  
Territory Bay City

REMARKS:

Pop. 32,000. - Lumft. Co. operating plants lighting  
streets and stores - have contract with city  
which lasts for 10 years.  
This is third best city in the State  
and San Diego's good business.

*[Signature]*

Gen'l. Agent.

City of West Bay City County of Bay State of Michigan  
 EDISON MACHINE WORKS.

CHARLES BATCHELOR, Gen'l. Manager.

Dear Sir:

Subject to your approval, I have appointed  
 as your Agent for

West Bay City

Name, M. Garland

Business, First Ward 22 Michy Co

Address, do do

Terms, 5 months sale

Territory, \_\_\_\_\_

REMARKS:

Pop. 12,000. The wires of the swift  
 are over here but they are  
 in trouble with Council as to  
 rent to be charged - Agents will  
 work for introduction of our light.  
 Excellent opportunities for isolated work

MB

Gen'l. Agent.

City of see below County of \_\_\_\_\_ State of Michigan  
 EDISON MACHINE WORKS.

CHARLES BATCHELOR, Gen'l. Manager.

Dear Sir:

Subject to your approval, I have appointed  
 as your Agent for

see as below

Name, M. Garland

Business, East Grandy Co

Address, Bay City Mich

Terms, 5 months sale

Territory, alone

REMARKS:

Bank }  
Shelburg }  
Riverville }  
Ascona }  
Am Samble } County }  
East Tawas } }  
Indiana City } }  
Prospective Sales }  
Isolated plants for mills

Harrisonville - Alcona County  
Alpena - Alpena County  
do do  
Towns  
on the  
Michigan Division  
Michigan Central Railway

MB

Gen'l. Agent.

(Form 6)

City of Laginaw County of Laginaw State of Michigan

**EDISON MACHINE WORKS.**  
CHARLES BATCHELOR, Gen'l. Manager.

Oct 6 / 1904

Name James D. Jackson  
Business Hardware Merchant  
Address Laginaw City Mich  
Terms 50% on cash sale  
Territory Laginaw City

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for  
Laginaw City

REMARKS:

Pop. 19,000 - Gas - No Elec Light  
ever used here - Town is ripe for  
it & prospects more than ordinary  
good - Excellent field for South  
work - Agent will (he says) purchase  
a plant to light his works, and he  
is rebuilding -

*[Signature]* Gen'l Agent.

(Form 6)

City of Laginaw County of Laginaw State of Michigan

**EDISON MACHINE WORKS.**  
CHARLES BATCHELOR, Gen'l. Manager.

Oct 6 / 1904

Name James D. Jackson  
Business Hardware Merchant  
Address Laginaw City Mich  
Terms 50% on cash sale  
Territory Laginaw

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for  
East Laginaw

REMARKS:

Pop. 39,000 - Smith Co. operating  
a plant in the city & in store -  
they cannot light Laginaw City now.  
There no shop are not allowed to cross now  
with their lines & cannot go around any  
distance - Excellent field for South  
work -

*[Signature]* Gen'l Agent.



City of Cross County of Leavenworth State of Michigan (Form 6)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, Genl. Manager.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Cross

Name John L. Jackson

Business Insurance Agent

Address Grand City Mich

Terms 5% commission

Territory Cross

REMARKS:

Pop 2500 - mills - isolated work -

Chas. L. Jackson  
Gen'l Agent.

City of Ludington County of Calhoun State of Michigan (Form 6)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, Genl. Manager.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Ludington

Name J. P. McMahon

Business Insurance Agent

Address Ludington Mich

Terms 5% commission

Territory Ludington

REMARKS:

Pop 5000 - Mills - Shuls lit with  
Coal oil - Prospects isolated  
work good - City work fair.  
Business is sustained by the mills  
and is only about fourth rate.

Chas. L. Jackson  
Gen'l Agent.

City Manistee County of Manistee State of Michigan (Form 8)  
 EDISON MACHINE WORKS.  
 CHARLES BATCHELOR, GEN'L. MANAGER.  
 Date Oct 7 1904  
 Name Ed. McMahon  
 Business Insurance Agent  
 Address Edgington Mich  
 Terms per five sale  
 Territory Manistee

REMARKS:  
 Pop 5000 - Good place  
Edgington - Good field for  
Isolated work as it has  
many mills -

Chas. B. Holden  
 Gen'l Agent.

City Red City County of Cass State of Michigan (Form 8)  
 EDISON MACHINE WORKS.  
 CHARLES BATCHELOR, GEN'L. MANAGER.  
 Date Oct 7 1904  
 Name Chas. B. Holden  
 Business Insurance Agent  
 Address Red City Mo.  
 Terms per five sale  
 Territory Red

REMARKS:  
 Pop. 5000 Mills - Agent is a member  
 of town Council and says he can  
 without doubt put a plant in at  
 once for town lighting  
Good Isolated work can be done  
 here -

Chas. B. Holden  
 Gen'l Agent.

City of Big Rapids County of Alcona State of Michigan (Form 6)

EDISON MACHINE WORKS.

CHARLES BACHELOR, GEN'L. MANAGER.

Dear Sir,  
Subject to your approval I have appointed  
as your Agent for

Big Rapids

Oct 8, 1904

Name, J. F. Burtch

Business, Insurance Agent

Address, Big Rapids

Terms, 5% on sales

Territory, Big Rapids

REMARKS:

Pop. 6000. Prospects for water station plant excellent.  
Agent says he can raise capital very soon -  
No electric here - Agent personally owns a  
water power which lies idle & which can  
furnish any HP required - They will start  
with about 40 lights - Can use over a  
hundred - Good field for isolated work.

Chas. B.

Gen'l Agent.

City of Grand Rapids County of Kent State of Michigan (Form 6)

EDISON MACHINE WORKS.

CHARLES BACHELOR, GEN'L. MANAGER.

Dear Sir,  
Subject to your approval I have appointed  
as my Agent for

Grand Rapids

Oct 9, 1904

Name, Raymond W. Kwo

Business, Insurance Agents

Address, 28 Canal Street

Terms, 5% on sales

Territory, Big

REMARKS:

Pop. 57,000 - ranks next to Detroit -  
Much operating, about 80 lights -  
Excellent field for isolated work -  
Rec my letter of even date re  
this place

Chas. B.

Gen'l Agent.

City of Grand Haven County of Ottawa State of Michigan (Form 4)  
**EDISON MACHINE WORKS.**

CHARLES BATCHELOR, GEN'L. MANAGER.

Dear Sir:

Subject to your approval, I have appointed  
 as my Agent for

Grand Haven

Name, John Platt

Business, Insurance Agent

Address, 5700 Cass St.

Terms, 5% on Gross Sales

Territory, Sub of E.H.

REMARKS:

Pop 5000 - Mills - Isolated work -  
 No Rec. Lt ever introduced here -  
 Gas just starting - No contact  
 yet with City - Prospects of  
 Central Gas plant moderate

*[Signature]*

Gen'l. Agent.

City of Muskegon County of Muskegon State of Michigan (Form 4)  
**EDISON MACHINE WORKS.**

CHARLES BATCHELOR, GEN'L. MANAGER.

Dear Sir:

Subject to your approval, I have appointed  
 as my Agent for

Muskegon

Name, Rayl. W. Andrews

Business, Insurance

Address, 1111 1/2 W. Cass St., Muskegon

Terms, 5% on Gross Sales

Territory, Muskegon

REMARKS:

Pop 5000 - Mills - Isolated work -  
 Brush people operating extensively -

*[This agent will work  
 on or three villages - mills -]*

*[Signature]*

Gen'l. Agent.

City of Peterborough County of Peterborough State of Ontario (Form 6)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, Gen'l. Manager.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for  
Peterborough & Campbellford

Name, C. F. Tate  
Business, Gen'l. Engineer  
Address, Peterborough  
Terms, 5% on Gross Sales  
Territory, Peterborough & Campbellford

REMARKS:

Peterboro: Pop. 8000 - Local Co. operating  
30 Rural Electric arc lights -  
Campbellford

Pop. (about) 2500 - No Gas - Ballant  
water power and a number  
of factories which we can get

C. F. Tate

Gen'l. Agent.

City of Hills County of Benzie State of Michigan (Form 6)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, Gen'l. Manager.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for  
Hills

Name, C. H. Barker  
Business, Telephone Exchange  
Address, P.O.  
Terms, 5% on Gross Sales  
Territory, Benzie & Hills

REMARKS:

Pop. 5000. Gas. Agent has 25 subscribers to  
Elec Light and several gentlemen ready to  
go into the personnel of a company.

Individual people wanted \$5000. for 30 light  
plant exclusive of power. Three or four  
mills here want Elec. Light. Prospects  
all around Ballant

C. H. Barker

Gen'l. Agent.

City of Three Rivers County of St. Joseph State of Michigan (Form 8.)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, Gen'l. Manager.

Dear Sir:  
Subject to your approval, I have appointed  
as your Agent for

Three Rivers

Name, A. C. Titus  
Business, Insurance Agt.  
Address, P.O.  
Terms, 5 per cent cash  
Territory, Gen'l. of Michigan

REMARKS:

Pop 3500. Coal Ab. Central Station  
prospects Excellent. Isolated  
prospects ditto. For details  
relative to this town see my letter  
of Oct 23/84



Gen'l. Agent.

City of See below County of See below

State of Michigan (Form 8.)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, Gen'l. Manager.

Dear Sir:  
Subject to your approval, I have appointed  
as your Agent for

See below

Name, A. C. Titus  
Business, Insurance Agt.  
Address, Three Rivers P.O. Mich.  
Terms, 5 per cent cash  
Territory, as below

REMARKS:

Constantine  
White Pigeon  
Mendon  
Centerville

County  
St. Joseph

Isolated work  
mills & factories



Gen'l. Agent.

City of Sturgis County of St Joseph State of Michigan (Form 2)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, Gen'l. Manager.

Dear Sir:

Subject to your approval, I have appointed  
as your agent for

Sturgis.

Name, Murray W. Klein  
Business, Water Works Pump Works  
Address, P.O.  
Terms, 5 to 10 days cash  
Territory, City of Sturgis

REMARKS:

Pop. 3870 - Coal Oil - Central Station  
and Isolated prospects Excellent -  
See my letter Oct 23/14

*[Signature]*

Gen'l. Agent.

City of Coldwater County of Branch State of Michigan (Form 2)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, Gen'l. Manager.

Dear Sir:

Subject to your approval, I have appointed  
as your agent for

Coldwater

Name, A. F. Chandler  
Business, Hardware & Groceries  
Address, P.O.  
Terms, 5 to 10 days cash  
Territory, City of Coldwater

REMARKS:

Pop 5000 - Gas sells @ 35c per 100  
and coal oil very extensively used in  
consequence. Central Station prospects  
Good - Isolated prospects average.

*[Signature]*

Gen'l. Agent.

City of Hillsdale County of Hillsdale State of Michigan (Form 6)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, GEN'L. MANAGER.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent

Hillsdale

Name, Robt. Hall

Business, Lottery marks & hall

Address, P.O.

Terms, 2 years franchise

Territory, Hillsdale & Battle Creek

REMARKS:

Pop. 6000. Gns. Central Station  
prospects Excellent. Isolated  
prospects very good. See my  
letter re this town under date  
Oct 23/84

*Charles Batchelor*

Gen'l Agent.

City of Battle Creek County of Calhoun State of Michigan (Form 6)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, GEN'L. MANAGER.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Battle Creek

Name, Hall

Business, Lottery marks & hall

Address, Hillsdale P.O. Mich

Terms, 2 years franchise

Territory, Hillsdale & Battle Creek

REMARKS:

Pop. 8000. Landmark Co. running a  
plant here - Central Station prospects  
doubtful. Excellent Isolated  
work. See my letter Oct 23/84

*Charles Batchelor*

Gen'l Agent.



City of Adrian County of Lenawee State of Michigan (Form 4)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, GEN'L. MANAGER.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Adrian

Name, John W. Mason  
Business, Dist. Rep. Mich. Ill. Ind. Pa. N. Y.  
Address, P.O.  
Terms, 5 Year grass sales  
Territory, Adrian & Tecumseh

REMARKS:

\$50,000 - Gas. Requires working for  
Central Station but think we can get it.

Isolated prospects Excellent.

See my letter Oct 23/84



Gen'l. Agent.

City of Tecumseh County of Lenawee State of Michigan (Form 4)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, GEN'L. MANAGER.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Tecumseh

Name, John W. Mason  
Business, Dist. Rep. Mich. Ill. Ind. Pa. N. Y.  
Address, Adrian & Mich  
Terms, 5 Year grass sales  
Territory, Adrian & Tecumseh

REMARKS:

\$5,000. Consists chiefly of Mills.  
and Isolated prospects Excellent.

Central Station prospects fair.

See my letter Oct 23/84



Gen'l. Agent.

City of Jonia County of Jonia State of Michigan (Form 6)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, Gen'l. Manager.

Dear Sir:  
Subject to your approval, I have appointed  
as your Agent for

Jonia

Name, E. J. Montgomery  
Business, Cashier  
Address, 401 W. 1st St. Bankers Bldg. Mich.  
Terms, 5% on gross sales  
Territory, City of Jonia

REMARKS:

Pop. 5500 - Gas - No Elec. Light ever  
introduced here - Good Central Station  
town but requires working up -  
Isolated work fair.

*[Signature]*

Gen'l. Agent.

City of Charlotte County of Eaton State of Michigan (Form 6)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, Gen'l. Manager.

Dear Sir:  
Subject to your approval, I have appointed  
as your Agent for

Charlotte

Name, Harner Green  
Business, Telephone Exchange  
Address, P.O.  
Terms, 5% on gross  
Territory, Zone of Charlotte

REMARKS:

Pop. 3800 - Coal Oil - No Elec. Light ever  
introduced here - Agent states  
that number of capitalists are  
talking of putting in Elec. Light -  
Small returns Isolated work -  
Central Station Zone

*[Signature]*

Gen'l. Agent.

City of Marshall County of Calhoun State of Michigan (Form 6)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, GEN'L. MANAGER.

Dear Sir:

Subject to your approval, I have appointed  
as my Agent for

Marshall

Name, W. B. Joyce

Business, Telephone Exchange

Address, Marshall

Terms, 5% Gross

Territory, Town of Marshall

REMARKS:

Pop. 4500 - Gas - Central  
Station Town - Small  
returns related work



Gen'l. Agent.

City of Kalamazoo County of Kalamazoo State of Michigan (Form 6)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, GEN'L. MANAGER.

Dear Sir:

Subject to your approval, I have appointed  
as my Agent for

Kalamazoo

Name, Geo. H. Winans

Business, Insurance

Address, P.O.

Terms, 5% Gross

Territory, City Kalamazoo

REMARKS:

Pop. 15,000 - Gas - Some time ago Bush people attempts  
to form company here but failed - Light manufacturing  
Gas people recently reduced price to \$2.00 per cft  
and anticipating Electric light rivalry distributed  
a lot of their stock so as to collect and annihilate  
local interest in their business. Think however  
that prospects for Edison Stations are good -  
related work good.



Gen'l. Agent.

City of Lansing County of Ingham State of Michigan (Form A)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, Genl. Manager.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Lansing

Name, Clarence E. Bennett  
Business, Appl. Mech. Mach.  
Address, Lansing Mich.  
Terms, 5th Press  
Territory, Lansing City

REMARKS:

Exp. 8000 - Vandepoer's operating plant  
of abt. 40 lights in store only - G.S.  
interest has been too strong for them to  
get street - Ralant prospects for  
Isolated work

W. H. K.

Gen'l Agent.

City of See Below County of \_\_\_\_\_ State of Michigan (Form A)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, Genl. Manager.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Same as above

Name, Clarence E. Bennett  
Business, Appl. Mech. Mach.  
Address, Lansing Mich.  
Terms, 5th Press  
Territory, as above

REMARKS:

Grand Ledge } County of Eaton  
Eaton Rapids

Portland

Mason  
Williamston

Isolated work

Jonia  
Ingham  
W. H. K.

Gen'l Agent.

City of Law Law County of Tan Baren State of Michigan (Form 4.)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, GEN'L. MGR.

Dear Sir: Subject to your approval, I have appointed as your Agent for

Law Law

Name A. B. Beube  
Business McMaster Bros & Co  
Address Law Law  
Terms 50% Gross  
Territory Town of Law Law

REMARKS:

Pop. 3500 - Isolated prospects poor.  
Town is in debt \$50,000.  
Taxes last year 3% of assessed  
value of property. Enterprise  
strangled.

A. B. Beube

Gen'l. Agent.

City of Allegan County of Allegan State of Michigan (Form 4.)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, GEN'L. MGR.

Dear Sir: Subject to your approval, I have appointed as your Agent for

Allegan

Name Est. Van Dstrand  
Business Telephone Exchange  
Address Allegan  
Terms 50% Gross  
Territory Town of Allegan

REMARKS:

Pop. 3000. Gasoline. Could rent from  
mills sufficient power for town  
lighting - Isolated prospects  
poor.

A. B. Beube

Gen'l. Agent.

City of Jackson County of Jackson State of Michigan (Form 6)  
OCT 16 1904

EDISON MACHINE WORKS.

CHARLES BATCHELOR, GEN'L. MGR.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Jackson

Name, W. F. Hatch  
Business, City Treasurer  
Address, P. O.  
Terms, 5% Gross Sales  
Territory, Jackson City

REMARKS:

Pkgs 20,000 - Vandepole Co. running about  
50 lights stores only. Consumers pay  
from \$12 to \$15. For months per light -  
A number of merchants will discontinue the  
use of it after they run through their present  
Contract - Excellent field for Central Station  
and Isolated work

*[Signature]*

Gen'l Agent.

City of Albion County of Calhoun State of Michigan (Form 6)  
OCT 16 1904

EDISON MACHINE WORKS.

CHARLES BATCHELOR, GEN'L. MGR.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Albion

Name, W. B. Guichenbaker  
Business, Dep. Town Manager  
Address, Albion Milling Co.  
Terms, 5% Gross  
Territory, Some of Albion

REMARKS:

Pkgs. 5000 - Gasoline - Town requires  
vigorous working for Central Station  
but can get influential support -  
Can sell ten or fifteen lights to  
Albion Milling Co. as soon as  
alternates ready - Isolated  
work fair.

*[Signature]*

Gen'l Agent.

City of Ypsilanti County of \_\_\_\_\_

State of Michigan

(Form 61)

**EDISON MACHINE WORKS,**

CHARLES BATCHELOR, GEN'L. MANAGER.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Ypsilanti

Name, Chas. Egan  
Business, Electrician  
Address, Ypsilanti, Mich.  
Terms, 5% cash  
Territory, Ypsilanti

**REMARKS:**

Pop. 7000. - Agent desires himself  
to start a plant of 20 lights.  
See my letter Oct 29<sup>th</sup> 1884.  
Isolated prospects good.

*[Signature]*

Gen'l. Agent.

City of Ann Arbor County of \_\_\_\_\_

State of Michigan

(Form 61)

**EDISON MACHINE WORKS,**

CHARLES BATCHELOR, GEN'L. MANAGER.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Ann Arbor

Name, Andrew Christie  
Business, Incandescent Light  
Address, P.O.  
Terms, 5% on cash sales  
Territory, Ann Arbor

**REMARKS:**

Pop. 8000. An Edison Incandescent Co  
is operating 200 lights. -  
People lighting streets. -  
Isolated  
prospects good.  
See my letter of Oct 31<sup>st</sup> 1884

*[Signature]*

Gen'l. Agent.

City of Ottawa County of Provinc State of Ontario (Page 6.)  
Nov 9<sup>th</sup> 1884

EDISON MACHINE WORKS.

CHARLES BATCHELOR, GEN'L. MANAGER.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Ottawa

Name, Arthur W. Soper  
Business, Telegraph & Electric Light Supply  
Address, P.O.  
Terms, 5% on gross sales  
Territory, Ottawa

REMARKS:

Pop. 40,000. Royal Leo. have 3 year  
contract with City for 165 lights.

Isolated prospects excellent.

See my letter under date Nov 9/84

A. W. Soper

Gen'l Agent.

City of Bellville County of Provinc State of Ontario (Page 4.)  
Nov 11<sup>th</sup> 1884

EDISON MACHINE WORKS.

CHARLES BATCHELOR, GEN'L. MANAGER.

Dear Sir:

Subject to your approval, I have appointed  
as your Agent for

Bellville

Name, W. Stewart Hunter  
Business, Mining Engineer  
Address, P.O.  
Terms, 5% on gross sales  
Territory, City of Bellville

REMARKS:

Central Station prospects excellent.

Isolated prospects fair.

See my letter under date  
Nov 9<sup>th</sup> 1884

A. W. Soper

Gen'l Agent.

ARTHUR W. SOPER,  
Manufactures, Repairs and Trades in  
Telegraph,  
and Electric Light  
Supplies,  
INSTRUMENTS, MATERIALS, AND  
WIRE, AND LINE EQUIPMENT.  
LEARNER'S TELEGRAPH INSTRUMENTS,  
OTTAWA, ONT.



City of Quebec County of Quebec State of Quebec (Form A)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, GEN'L. MANAGER.

Dear Sir:

Subject to your approval, I have appointed  
as your agent for

Quebec

Name, F. L. Whittle  
Business, Gen'l. Merchant  
Address, St. John St.  
Terms, 5% per gross sales  
Territory, City of Quebec

REMARKS:

Pop 70,000. Rapid (local) Co.  
operating 20 lights - will increase  
shortly - Good prospects for  
isolated work - See my letter  
of even date herewith.

*[Signature]*

Gen'l. Agent.

City of Montreal County of Quebec State of Quebec (Form B)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, GEN'L. MANAGER.

Dear Sir:

Subject to your approval, I have appointed  
as your agent for

Montreal

Name, Alex. MacKenzie  
Business, Gen'l. Engineer  
Address, 2 Rue de la Paix  
Terms, 5% per gross sales  
Territory, City of Montreal

REMARKS:

Pop 190,000. The largest and  
best city in Canada -  
See my letter Nov 13/04

*[Signature]*

Gen'l. Agent.

City of Kingston County of Quebec State of Canada (Form 4)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, Genl. Manager.

Dear Sir,

Subject to your approval, I have appointed  
as your Agent for

Kingston

Name, J. Y. Guel, Manager  
Business, Federal Bank of Canada  
Address, P.O.  
Terms, 5% on gross sales  
Territory, City of Kingston

REMARKS:

Pop. 14 000 - Central Station prospects  
good. Isolated prospects  
excellent. See my letter under  
date Nov 9/56



Gen'l Agent.

City of Brockville County of Quebec State of Ontario (Form 5)

EDISON MACHINE WORKS.

CHARLES BATCHELOR, Genl. Manager.

Dear Sir,

Subject to your approval, I have appointed  
as your Agent for

Brockville

Name, Comstock & Halladay  
Business, Brokers  
Address, P.O.  
Terms, will advise later  
Territory, City of Brockville

REMARKS:

Pop. 9000. Central Station prospects  
excellent. Isolated prospects  
good. See my letter under  
date Nov 9/56



Gen'l Agent.

Scrapbook, Cat. 1138

This scrapbook covers the period February-December 1885 and contains clippings concerning electric railroads. Included are clippings relating to the installation and operation of electric motors and railway equipment on New York City elevated railroads. There is also material about electric railways in various other cities. The spine is labeled "E. R. Co. of U.S. No. 1." The book contains 171 numbered pages.

Blank pages not filmed: 27-171.















Cleveland, O  
Sun  
9/18/25

### TESTING THE DAFT MOTOR.

**RUNNING AT THE RATE OF TWENTY MILES  
AN HOUR.**  
A test of the practical working  
possibilities of the new Dett electric motor.

[illegible]

In the motor tank cars in the case of the fire, the firemen were not permitted to be engaged in switching to and from, and at 6 o'clock the train backed down upon the main track and pulled out for the city of St. Mitchell directly. It rumbled over the road at a lively gait and was the cause of the street being closed for a great part of the forenoon. The drivers of the motor cars were piloted in accordance with the regulations of the railroad, and in nearly every case the police, starting to clear a street for the fire engine, were obliged to turn back their heads and start back to the city point at the annual circus. One hundred horses in a saloon ran out and chased the train upon street rails composed of iron for the length of the city. The fire engine was not allowed to go, and in 1904, when there were no more on the pavement until the train went past.

was that the engine in the generating room was not running at more than three-quarters an hour. On a level the train buzzed along at the rate of 20 miles an hour. At Fifth-street the motor was attached to the other end of the car, the run back was begun. The speed for most of the distance was about 25 miles an hour. Run to Fourteenth-street was made in 564 seconds. J. R. Bain, the inventor; M. M. Howarth, the manager of the company, and J. K. Wright, one of the directors, were

themselves as entitled with the test. Other will be ready from time to time during the few days.

*Journal*  
*Elizabeth, N. J.*  
*8/28/85.*  
**THE ELECTRIC MOTOR.**  
And now the electric motor will be tried upon the New-York Elevated. It is claimed that there will be considerable saving of expense over steam engine. Whether that be so or not, there will be none the less

1000

**THE DAFT MOTON.**  
Successful Experiment in Drawing a Pa  
Train Last Night on Ninth Avenue  
Another experiment intended to the  
power of the Daft Electric Motor in

The motor was attached to a train of cars and sent north on the eastern from Fourteenth street. It glided smoothly and noiseless and without any perceptible vibration. The speed equaled an ordinary train. Expected that with such a train attached to the motor, the cars would slip its wheels, but there was no such thing. Leo Ditt, the inventor of the motor, said that the motor was the first of its kind and will give a public exhibition in a few days.

"We regard the performance of last night as a very important one," said Secretary H. C. Smith, "and we are glad to see that the 'woman' has proved that Mr. Ditt has the powers of his machine correctly. It demonstrated that the light motor can do as much as the heavy one. The next step will be to make experiments on the passenger cars."

N. Y. News  
Sept. 19/8  
ELECTRIC LOCOMOTION ON  
"L."  
A very successful trial of the Delt electric locomotive was made last evening, a train of cars having been furnished for the occasion by the Manhattan Company. It seems to be practically demonstrated that this electric locomotive is entirely adequate to

public can look forward to the hour will supplant steam power and do away the noise, smoke, grime and objectionable features in general of the system presently employed. As economy will be served by the introduction of this new plan, there will be encouragement to

question of farms on the elevated roads  
 consequent increase of patronage.  
 Wall St. N. Y.  
 Oct. 3/8

rated road after the regular travel limitations had been put in place.

The guests did not leave waiting for the motor with four cars attached to it.

the dynamo and the engine, G. W. open the motor door to allow the dynamo, but did not attempt to answer questions that were put to him by magistrates.

house on the street and failed  
to rush to the window  
speculation was kept up

pride at Thirty-first street was stopped, the train slowed down and then, Sidney Delban, who was born just behind the reactor, announced that the train had reached the station. The events unfolded on the reactor was, when a little boy who had been watching the procession out:

"Say, reactor, didn't you better

[illegible]

"What is all that fire you have on your back?" asked Mr. Dillon. "Ain't you afraid of it?"

"No, that won't burn."

"What kind of life is it that won't burn?" asked Mr. Dillon.

Richard Lucas smiled and said:

ES. After the train had been shunted, track and run to Forty-second street visitors to the train, which then returned to Fourteenth street, and

trip in five minutes. During the ride  
said he was a Wash. reporter:  
"The main thing to show in this case  
that they have the power under control  
they seem to have accomplished. To  
it only requires a refinement of tactics  
it is success."  
He said further that he did not know  
"taking the place of steam as a motive  
he did not thoroughly examined it.  
Bussell's cargo was quite confidential.

believes that this is the future motive I hope to see it universal."

planted to the reporters the custom of  
Sent. The brush, which is composed  
ber of thin copper plates about 1  
which is attached and connected

tor and take off the electrical connections, the two wheels mounted on the axle to the wheel are slightly separated.

... portion of their costs  
estimated and thus the current is dimi-  
nished. The engineer board is  
... with a large dam which, when

charged and bewled, turned up like  
you in office had to be sobelated. I  
said that he was satisfied that he co

The professor who made the trip pleased with the success and on he congratulated Mr. Daft upon his success.

led to take another risk. Through  
his trip the dynamo in the motor  
tol. at green light, which lit  
and which would at 15

brightly accompanied with a sharp  
toy pistol. Ties and the constant  
the street of large sparks of

had been made previously, but it does not state that the prior can draw four cards with-





The streets of which the company took possession here have been in a condition of general approval. Ordinary business and traffic have been untroubled, and the people here who seem to be a class of the worst several people who were in a Market-street car were seriously, if not fatally, injured by a collision that occurred without warning. Cars that had been standing at a transfer station were suddenly piled on a lamp and wrecked. A broken strand of the hidden cable had caught the grips of the car, and this car had demolished the other. The driver could not be held responsible, and the investigation could not be completed. The investigation could not be completed. The investigation could not be completed. There was no excuse for the unfortunate passengers.

*Eagle*  
Nov. 4/85

TO INSPECT EASTON HAILROAD.

President Duff, of the East Electric Motor Company, has been called upon by the Brooklyn railroad company with a view to having their representatives to their plant and inspect the three miles of his road to be used for operation to that city. The proposition has been cordially received and a party of passengers are likely to soon make the excursion.

It is to be hoped that the Board of Aldermen will not grant a charter for a surface route on Fifth avenue. It is less than a week since street in this city with street railway tracks. There is a growing need of more railroad transportation. It is time for the thinking people to take the trouble to study the demand for tunnel-ground roads.

New elevated roads are not to be tolerated. Cable roads are too slow, though a considerable improvement on horse cars. Under-ground roads seem to be the only way out of the traffic jam. We have already recognized the necessity of burying the telegraph wires, and the next step should be to follow suit with the street rail.

The people of the Old World have not as yet exemplified and showed us how to circumvent the difficulties of the problem. The earth levelled by the streets of London is literally manured through and through, and a large part of the rail traffic of that city is conducted under ground.

N.Y. Jour.  
Nov 19/0

Journal

**Special Test on the**  
**Eleventh Hour.**  
are you?" said Sidney  
greatest Cyrus W. Field  
Kluis aboard Elwood  
"I'm not much  
ow, but how are you?"  
was conspicuous in a  
"I got aboard," "This was  
no millionaire, laugh-  
on the platform of the  
were attached to the  
Two lines to be put to-  
about two hundred  
of the train, and  
of the Society of Ele-  
ment the president  
Frederic D. Miles, Charles  
with the Inna-  
J. P. Arthur, Sec-  
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Company, Nathan Isa-  
son, J. W. Husula,  
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tion, C. B. Borowy, T-  
super, Washington A.  
President of the  
Dr. Davis, J. C. Canna-  
Superintendent  
L. Buck, George H.



... of the latter's ...  
... Al. Hlowasworth and J. ...  
... the Duff Company, and ...  
... of Civil Engineers. Several ...  
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... Franklin was run regularly, drawing ...  
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1



**ELECTRIC MOTOR ON THE NEW YORK ELEVATED**

**RAILROAD**

Preliminary trials of a half electric motor, the Bu Franklin, have been in progress for some time past on a portion of the Ninth Avenue Elevated Railroad of this city, extending from 34th to 52d Streets. The dimensions of the principal parts of this motor are as follows:

Driving wheels, 48 in. diameter; trail wheels, 36 in. diameter; length over all, 14 ft. 6 in.; spread of wheels, 3 ft. 6 in.; diameter of armature, 35 in.; weight of armature, complete with shaft, 850 lb. Total weight of motor, 8½ tons. Ratio of armature revolutions to drives, 1:25. Ratio of peripheral speeds of armature and drives, 1:28½. The reversing arrangements consist of four brushes attached with compound levers, and so connected that the direction of rotation must necessarily be that best suited to the proper contact and wear of the brushes. There is also automatic provision made for varying the points of contact in proportion to the load, speed, etc. The regulating switch consists of a sliding plate having metallic contacts arranged on its surface in such a manner that a number of spring contacts will cut changes in the internal resistance of the machine, so as to regulate the speed without the use of idle resistances, none of which are employed; the highest economy is therefore ob-

tained with light as with heavy loads. The electric brakes are of the pendulum type, which were first used on the Mt. McGregor motor in 1883, and are connected with a switch conveniently arranged to vary

their power by variation of internal resistances. The mechanical brake consists of a compound lever attachment operated by a screw shaft through a flange mounted unit. Contact with the brake rail, placed between the main rails, is effected by means of a phosphor-bronze wheel attached to a movable framework, which can be raised and lowered as occasion requires, by means of the lever shown in the side elevation, Fig. 2.

Upon each end of the armature shaft is a small wheel, formed with corrugations on its face which fit in corresponding corrugations on the face of a larger wheel mounted at each end of the driving wheel axle. As will be seen by reference to the drawings, Figs. 3 and 4, the electro-dynamic machine is pivoted at one end in resilient bearings and attached to a vertical screw shaft at the other end, so as to enable the operator to vary the frictional contact between the friction gearing at will, and also affording an easy and convenient means for raising the whole machine to effect a change of armatures.

In order to avoid damage to the gearing and other parts of the electro-dynamic machine from shock, the whole machine is maintained in about equal resilience by means of alternating balance of iron and India rubber placed over the bearings of the drivers in lieu of the ordinary springs, and again in the pedestals at either end of the

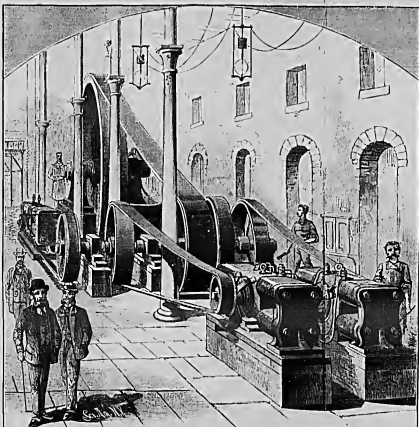


Fig. 1.—DYNAMO STATION OF THE DAFT ELECTRIC MOTOR.



Fig. 2.—A STATION VIEW OF THE DAFT ELECTRIC MOTOR ON THE NEW YORK ELEVATED R.R.

# **ELECTRIC MOTOR ON THE NEW YORK ELEVATED R.R.**

(Continued from first page.)

the electro-dynamic machine. The object of using these insulated machines is to avoid the too considerable noxious which would result from the use of the ordinary springs, and at the same time provide a degree of resilience which enables the machine to run over very rough roads without the least derangement of parts.

The car contains also a voltmeter, which shows the engineer the difference of potential on the track, just as the ordinary pressure gauge now indicates the pressure in a boiler.

The rails are the ordinary 50 pound steel rail, insulated by means of the Duff insulator, which consists of an umbrella of cast iron with head so formed as to readily admit of locking the base of the rail by means of two cap screws and washers. The standard is formed of any suitable insulating material; the standard now in use on the elevated road consists merely of baked hard wood saturated with asphaltum, which has so far been found to afford ample insulation for all practical purposes—the leakage with four miles of track now in use (two miles of double track), plus the switches, being inconsiderable. The joints are made by drilling holes in the web of the rail, and stretching strips of copper from one to the other; this method has been found entirely satisfactory, both here and on the road now in operation in Baltimore—the resistance having thus been reduced to nearly the calculated line resistance.

No difficulty has been experienced in making the switches, though in some instances a considerable interval has to be bridged by momentum alone, due to the necessity for leaving the third rail in order to permit the passage of the ordinary steam locomotives; this difficulty would of course be removed in the event of the entire road being operated electrically. The maximum gradient is one of 103 feet per mile between 23d and 24th Streets. This has been surmounted with ease with fairly well loaded trains, and on several occasions an average speed of 20 miles an hour has been attained.

The track is vitalized by dynamos (Fig. 1) situated at the main station on 15th Street, about 200 yards

from the track, it having been considered desirable to place the vitalizing machines as near one end of the track as possible, so as to show the influence of distance in lowering the potential.

The effect of these two miles is, therefore, rendered equal to four miles where the station is centrally placed, and the loss of energy at the extreme end is

alarm. There is also an attachment to indicate when the short circuit is removed. The machines are connected to the track by means of 9000 copper wire, with Underwriter's line insulation suspended upon poles.

The motor has already run several hundred miles on the short track at 14th Street, making many hundred stops and starts, involving much severe work, hauling

four cars for a considerable portion of the time, and also a two-car train, for the purpose of making close observations as to the difference in consumption of fuel. With regard to this all-important question, the tests are as yet necessarily incomplete; but so far as they have gone, the indications are claimed to be eminently satisfactory. The extraordinary adhesive properties of a locomotive operated in this manner are evident. This feature is well illustrated on the line in Baltimore, which at one point has a curve of 55 feet radius on a gradient of 353 feet, and yet no difficulty has been experienced by the motor in ascending this grade with a loaded train. So successful has been the working of the Baltimore road that two more motors have been ordered, making a total of four.

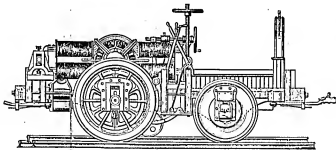


Fig. 3.—SIDE ELEVATION OF THE ELECTRIC MOTOR

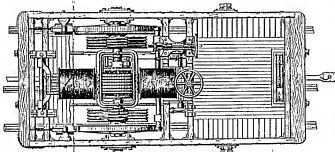


Fig. 4.—PLAN VIEW OF THE ELECTRIC MOTOR.

largely observable. The vitalizing system at the station consists of three No. 5 Duff dynamos, actuated by a Wright automatic cut-off steam engine, having a cylinder 18 x 43 inches and a flywheel 10 feet by 20 inches. There is, in addition, a small arc-light Duff dynamo used for lighting the station and boiler room. The machines are connected with a switchboard, so that they can be placed in "parallel" or "series," as may be desired, and there is in addition an automatic cut-off, which operates in the event of a short circuit on the track, so as to open the circuit at a fixed point, and at the same time give the engineer notice by ringing an







Scrapbook, Cat. 1140

This scrapbook covers the period 1885-1886 and contains newspaper clippings relating to electric lighting and telegraphy. Much of the material deals with patent litigation between the Edison Electric Light Company and the Sawyer-Mann Electric Light Company. There are also clippings concerning the railroad or "grasshopper" telegraph, overhead and underground wiring, marine applications of the electric light and telegraph, and non-Edison electric inventions. Reprints of Edison Electric Light Company circulars appear in some of the clippings. Included also are clippings pertaining to Edison's purchase of Glenmont and his acquisition of property in Florida. On page 134 there is a telegram to Edison about a telegraph installation on Staten Island. The inside front cover is inscribed "Patent Suits Vol. I." The book contains 134 numbered pages.

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1140

Patent Quilt  
Vol. I.



[illegible]



The tower system is a failure—a bitter and an expensive failure—in Detroit.  
It is a failure at Rock Island.  
It is a failure at Quincy.  
It is a failure at Aurora.  
It is a failure at Davenport, Ia.  
It is a failure wherever it has been tried.









March 27  
Page 720  
720

Character of article.

From the

Published at

Date

One of Thomas Edison's experts has been experimenting during the last four days with an invention on the line of the "Hawkeye" Island Railway Company. The new device is intended to permit engineers to communicate easily with one another when the train is a mile apart and in motion. The medium of communication is the telephone wires along the railroad and an instrument in the engineer's car. The appliance is designed to prevent collisions in foggy weather at curves or on terminals. It resembles the telephone in some respects. Flagen and dispositive wires can also use the instrument to communicate with approaching or passing trains, no matter at what point they may be running. The first thin for him being conducted with a good deal of secrecy, and neither the operator nor Mr. Edison's private secretary would give any particulars of the invention except to state that the experiments were successful and when the plans are sufficiently perfected, collisions between trains will be almost impossible. It is considered most valuable invention and Mr. Edison desires to secure all the foreign patents before making anything known about it. He expects to have it completed in about two weeks.

Character of article.

From the

Published at

Date

Even Radio Over the Electric Traction. Applied for an early yesterday by the Edison Electric Light Company, the Edison Electric Light Company has applied for a patent for an improvement in the electric traction system. The invention is a device for transmitting electric energy over the electric traction system. The Edison Electric Light Company has applied for a patent for an improvement in the electric traction system. The invention is a device for transmitting electric energy over the electric traction system.

Character of article.

From the

Published at

Date

**PLATINUM AND ITS USES.**  
Almost nothing the precious metals. Platinum takes shape a New Demand for It.  
There is no one establishment in the city where platinum articles are manufactured. The place is on the line of the "Hawkeye" Island Railway Company. The new device is intended to permit engineers to communicate easily with one another when the train is a mile apart and in motion. The medium of communication is the telephone wires along the railroad and an instrument in the engineer's car. The appliance is designed to prevent collisions in foggy weather at curves or on terminals. It resembles the telephone in some respects. Flagen and dispositive wires can also use the instrument to communicate with approaching or passing trains, no matter at what point they may be running. The first thin for him being conducted with a good deal of secrecy, and neither the operator nor Mr. Edison's private secretary would give any particulars of the invention except to state that the experiments were successful and when the plans are sufficiently perfected, collisions between trains will be almost impossible. It is considered most valuable invention and Mr. Edison desires to secure all the foreign patents before making anything known about it. He expects to have it completed in about two weeks.

Character of article.

From the

Published at

Date

Character of article.

From the

Published at

Date

# The Evening Standard.

NEW BEDFORD, MASS.

MONDAY EVENING, MAY 22, 1885.

Published at

Date

Character of article.

From the

Published at

Date

Character of article.

From the

Published at

Date

Character of article.

From the

Published at

Date

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Character of article... *Review*  
From the *Times*  
Published at *10/11/18*  
By *Aug 2 18*

[illegible]

\$2,000 to \$10,000 a piece, Howard Macdonald offered the model of an invention he had seen for carrying a large quantity of wire on a single strand of ground. It consisted of a block of seasoned lumber treated with paraffine, through which a number of wires were stretched. The wires, according to Macdonald, were insulated by the waxy substance which he had around them. The wires themselves he thought any number of sizes could be made, but he had not yet made the square block. The wires, he said, were tapered in order to be covered with enamel, and to protect them from rust. He said he was not interested in the claim, but was willing to give his opinion by giving to each wire a separate coil. He could give no estimate of the cost of

[illegible]

The *Narrative of the American Underground Electric Wire Company* produced a series of maps of the city of New York showing the flow system. In this the electric wire was shown to exist in a system of loops, the link between the telegraph and telephone wires, to be buried on rods along the street. A comparison of these maps with the present-day commissions for term 2000 to 1900 wires, such as the New York City Commission, shows the result of artificial street, without cost of artificial street. Provision for entering the result in to the street and avenue along the line, and branch lines, and the result of the system of similar wires, are to be constructed for the second class of branch wire.

Character of article cd  
From the Times  
Published at  
Date Sept 11 83

### UNDERGROUND WIRE

[illegible][illegible]

FROM ELECTRICAL REVIEW

Edison Electric Light Co.,  
Harrisburg, Pa.

This company has been in operation about three months and is required to be on a dividend paying basis from the start, a rather unusual thing. It got the money for the company from the sale of the stock, new on a paying basis, and this has therefore been the result with starting capital electric light station. The company is a very small company, and it is a long time to get customers to pay for starting the station, but this company handled another one. The company is a very small company, and it is a long time to get customers to pay for starting the station, but this company handled another one. The company is a very small company, and it is a long time to get customers to pay for starting the station, but this company handled another one.

[illegible]









133

received in Edinburgh on

1 Day

PROF. BELL has been making some singular predictions in regard to the time when we shall be able to see people at a distance by means of electricity. And yet, wild as the idea seems to some, who can guisany him? The invention will be made sooner or later. But it ought to be supplemented by an invention enabling a man to avoid seeing his inopportune creditor or anybody else capable of becoming a bore. Mr. Edison is glad to be deaf, and there may occasionally be an advantage in imperfection of the organs of hearing, sight and speech.

1144

About 1871, it is said, Menzel met with an accident by the explosion of a boiler and was reduced to great extremities of poverty. His wife, after disposing of her jewelry, sold all the instruments to a second-hand dealer on Staten Island, named John Flemming, for \$40 and some improvements on a stove. From this man Doctor Beckwith says the old instruments were recovered.

NY 100

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Character of anti-

From the

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115

**Edison's Electric Patents.**—*Times*, July 12.—The July number of the *Electrician* contains an article on the patent litigation which has been commenced between the principal incandescent electric lighting companies doing business throughout the country, under the title of "The Edison Patent." The article discusses the patents which are mainly dependent upon by the Edison Company to establish their exclusive right to manufacture and use incandescent lamps. It states that already expired patents in this direction respecting inventions which were patented abroad before being patented in this country. Strong evidence is also given in support of the position that the Edison patent is a legal monopoly of novelty. The question is a very important one, and involves enormous monetary

Number of act

**Index**

## Index

15

Although President Johnson, of the Electric Power Company of the United States, is confined to his house by a painful but not dangerous illness, he receives frequent visits from Mr. Hatcher, of the Edison Machine Works, and the work of preparation for the exhibition of electric motors for the Second avenue "L" system. The distribution of rails prepared as rapidly as possible and the general exhibition is really ready for the display, which will be somewhat delayed on account of the numerous visitors of the machine works. It is not thought that this will produce material delay. The work of completing the second track program is rapidly.

100

## CHAPTER 1

## Conclusion

1714

One of Thomas Edison's experts has been experimenting with an invention on the trains of the Staten Island Railway Company. The new device is intended to permit the engineers of trains to communicate easily with one another when the trains are in motion. The instrument is a small telephone in the telegraph car, and an instrument in the passenger car. The apparatus is designed to operate in foggy weather or on curves or on hills. It resembles the telephone in some respects. Firemen and depot-watchers can also use the instrument to communicate with approaching trains, no matter at what speed they are running.

Character of article

From the

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**Tux Western**

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have become so 'unscrupulous' and the parties pushing them so 'unscrupulous' in their dealings with the public, that the Edison Company has decided to appeal to the courts for the protection of its rights, and the list called for will be used as a basis for future legal proceedings. Similar suits have already been begun by the Edison Company in New York, Messrs. William M. Evans and Horace Conkling acting as counsel.

*New York Daily News*

1000

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**Index**

The appliance is designed to prevent condensation in foggy weather at curves or on terminals. It resembles the telescopic tubes used in the telephone. The appliances can also use the instrument to communicate with approaching or passing trains, no matter at what speed they may be running. The trials thus far have been conducted with a good deal of secrecy. Mr. Edison desires to secure all the foreign patents before making anything known about it. Its exposure to have it completed in about two weeks.

### Character of art.

Figure 11

16.3.3.3.

129

—One of the most convenient among the various electrical control devices which have been brought forward as auxiliaries in the following English device, enabling a person to make a telephone call without the necessity of making contact, the half-actuation of the button causes the bell to ring, while the full stroke causes the receiver to connect with the line, in a simple telephone receiver consisting of an electromagnet with a soft iron core, and a bell with a contact arm. The bell is connected to the line by a contact arm of the electromagnet. The bell is connected to the line by a contact arm of the electromagnet. The bell is connected to the line by a contact arm of the electromagnet. The bell is connected to the line by a contact arm of the electromagnet.

1. *Variable*

### Chara

## Index

10

Enson has again distinguished himself. This time it is a device for communicating with moving trains. It is receiving considerable attention, the press seeming to regard the idea as novel. A device for that purpose was patented by Dr. Fallerton of this county about a year ago. A friend of the writer invented an electrical apparatus for the same purpose five or six years ago, but it was not successful.

before. The

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lively, of real practical importance.



are absorbed in something as to become  
new and unaided. It may become a  
yielding wholly to a native impulse  
telling on one thing, but the same self-  
that concentrates biographies at will  
also divert them at will into aesthetic  
channel when the proper time arrives  
may things rightly claim our attention  
none of them will receive it aright  
thoughts aimlessly wander from one  
other, without compass or guide.

last six months of 1946. The capital is \$53,000 and capacity 2000 lamps. The capital of the British parent company is unchanged, being £1,244,000, of which £350,017.60 is paid for cash, £117,450 is assured to T. A. Edison for patents, leaving \$116,531.90 to the treasury due Mr. Edison, etc. The balance sheet shows the book debts and credits as follows:—The assets, £1,244,000, less £350,017.60, the capital, £893,982.40, less £116,531.90 in loans from sub-companies, £777,450.50, dividends and royalties collected and banked in accounts payable. The stock of the Edison company is £10 bid, 75 asked. It once sold

The Edison electric light company of New York, after three years of business, has declared a dividend of one per cent. During that time the gas companies have declared ten per cent. dividends four times a year. Gas is king.

[illegible][illegible]

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[illegible]

There was some little feeling among the public adverse to the action of the telegraph company in the former case, and this is likely to be intensified by the new proceedings. At least this is to be judged from expressions

Date: July 1964

Published online 22 April 2010

There are but four names to be written: (bared or Bonaguet, who discovered the effect of the voltaic current upon the magnet; Galvani, who discovered that the current could concentrate magnetism; Sturgeon, who produced the first electric magnet; and Henry, who discovered the conditions under which an electric current could be maintained at a distance—who invented the device by which it could so concentrate its force as to produce an operative telegraph, or the means of forming and sustaining a light now in use all over the world. Beyond their discoveries and inventions, there is no more to be said, except that which was of common knowledge when those discoveries were made; and that the latter were made, which is not far below the level of discovery or invention. This is the record, and so

Messrs. Buckingham, Dinkerson and Dimehan appear as attorneys for the Western Union, and Messrs. Lowrey and Bacon for the Baltimore and Ohio.

[illegible]





**FILE**

A decision has just been made in the Patent Office which will probably be very soon followed by the use of electricity as a motive power on the elevated railways in New York. For four or five years a contest has been going on between Mr. Field, of New York, Mr. Edison and Sir William Siemens, lately deceased, for priority of invention of the system of electrical railroading employing, in whole or in part, the rails and wheels of the cars as conductors. The case has been successively decided in favor of Mr. Field's claim at every stage of its progress through the Patent Office, and Commissioner Montgomery has just affirmed the previous decision by refusing an appeal made by the other contestants.

From the

100

Preparations for the Use of the Edison Lights Nearly Complete.

The work of substituting the Edison incandescent for the Argand or electric light is progressing very satisfactorily. The new lines recently put up to accommodate the new system in the business portion of the city were tested last evening and found to work well. The time for the introduction of the changed plan is drawing near and it is expected that the light will be ready to burn on Saturday night.

In the test last evening the two larger Edison dynamos were run at 850 revolutions per minute. Their regular speed is to be 800 revolutions, and each one of the three will of that rate be able to supply 300 lights of 10 candle power. There are besides the large dynamos two smaller ones of one-half the capacity. The two smaller ones are run by a 100 horse power engine, and the larger one by a 200 horse power engine. The main engine runs the Armagh dynamos, which are still in the process of being tested, and will be run when the 100 candle lights is completed. When they will be run, the 200 candle Edison dynamo. A 50 horse power engine, built by Armstrong & Siemens, has been put in for the purpose of furnishing 100 candle power to run the two smaller Edison dynamos.

1910/11

**PATENTED**  
The important suit which has been brought to test the title of the Edison Electric Lighting Company to use the incandescent lamp is granted by Mr. Edison illustrates unequivocally the practical failure of our patent system to prevent its abuse. Mr. Edison claims to have invented the method of electric lighting in use in the company bearing his name, and claims priority of invention. The Sawyer-Man Company also claims priority in the same invention. On hearing before the Patent Office, the use of the fibrous filament was finally awarded to Sawyer & Man, and the suit is now brought to sustain Mr. Edison from infringing their patent.

[illegible]

But the really proposed is probably worse than the existing evil. The American patent system, with all its faults, has been of great service in attituding the inventive genius of the nation to the necessities of improvement and improvement, particularly with a view to the benefit of the inventor advantages which, as matters now stand, usually accrue mainly to the capitalists who undertake the prolonged struggle in the development and defence of a patent. The proposed change would be more than likely to destroy it. It ought to secure a more thorough investigation of the facts upon which a claim is based, and of rival claims, and a decision no less worthy that it shall carry with it a measure of finality. It is difficult, if not impossible, to reach decisions could be reached. The contents based by the Department at W. Washington, it would then be improper to give to the

holders of patents must comply with respect to the defense of their claims in the courts which they do not now possess. The root of the difficulty is that the decisions of the Patent Office have not been found trustworthy. The fault has lately been many times with the courts, which have undertaken to decide patent questions without adequate inquiry or knowledge. But it is also true that in many other cases the Patent Office itself has been found in fault. It is worth while to consider whether means cannot be devised to secure more thorough investigation, and a sounder decision by the Department at Washington.

THE INDEPENDENT. May 28/85

[illegible]

From 12

Date \_\_\_\_\_

tion that telegraph messages are now being sent by radio waves. The fact that these waves travel at the speed of light shows that there would be danger of the messages being received before the ship contains complete information. The attention of navigators has been called to this fact, and it is pointed out that the effect is most serious when the "radio wave" carrying back the current to the shore station is reflected by the water. The ship is unable to complete the circuit, just as the earth is unable to telegraph, and the ship is left in the dark. The wires which Mr. Morse originally thought of using have been replaced by electrical currents. It has been found by experiment that the speed of the waves traveling over the water is about the same as they are over land. The danger of the ship being left by a distance, the currents have been detected as many as 100 miles away. It is very possible that the ship will be able to command the shore station, and the shore station will be able to command the ship. The scheme of storing messages by electricity has been tried, but it was found that the messages were not received as fast as to be practically useless. It is obviously necessary that every message be received as fast as it is transmitted by experiment to see whether the companies are affected. Several questions have been raised, and the answer is that the companies have never been practically tested, or even raised. What effect, if any, does the fact that the messages are sent by radio waves, subject to its influence? Several questions have been raised, and the answer is that the companies have never been practically tested, or even raised. What effect, if any, does the fact that the messages are sent by radio waves, subject to its influence? Several questions have been raised, and the answer is that the companies have never been practically tested, or even raised. What effect, if any, does the fact that the messages are sent by radio waves, subject to its influence?

Character of article  
From the  
Editorial  
The

# ELECTRICITY VERSUS STEAM.

The New System of Electric Illumination to be Tested in New York.

Special Correspondent.  
New York, July 1.—The experiment just being made in the electrical district in New York City, in the introduction of Edison's new system of electric lighting, is the first step toward the final triumph of electricity over steam in the world's great cities. It is the first step toward the final triumph of electricity over steam in the world's great cities. It is the first step toward the final triumph of electricity over steam in the world's great cities.

The writer accompanied a very complete set of full descriptions of the Edison system of electric lighting, which were sent to him by the Edison Electric Company, in New York. The writer accompanied a very complete set of full descriptions of the Edison system of electric lighting, which were sent to him by the Edison Electric Company, in New York.

Mr. Edison's system of electric lighting is a very complete set of full descriptions of the Edison system of electric lighting, which were sent to him by the Edison Electric Company, in New York. The writer accompanied a very complete set of full descriptions of the Edison system of electric lighting, which were sent to him by the Edison Electric Company, in New York.



Diagram of a dynamo machine with labels A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z.

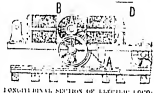


Diagram of a dynamo machine with labels A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z.

a power of turning this long and thin shaft into a power of placing upon the sum of the power factors, which, when the shaft is turned, it is that of the power factors.

The Edison system differs from the Duff system in many particulars, chiefly that the motors, which are a new feature, are attached to the main shaft, and are not, as in the Duff system, attached to the main shaft.

Character of article  
From the  
Editorial  
The

Character of article  
From the  
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Character of article  
From the  
Editorial  
The

with which he began the electric light experiment. It was actually only known in 1877 to attract the attention of capitalists to the science and the power of the Edison Electric Light Company, after the tremendous success of the Edison Electric Light Company, after the tremendous success of the Edison Electric Light Company.

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At a invitation of a foreign government, says a London paper. Mr. Reckless, who has done much for the application of storage batteries to the propulsion of motor cars, has produced designs for a torpedo service launch, to be propelled by a turbine engine driven by electricity. The conditions stipulated are that this craft should make voyages across the English channel and be able to moderate its water work. It is confidently believed that the test can be completed, and the construction of the vessel and machinery is to begin without delay. In view of imperative requirements in the electrical appliances, the speed may be expected to exceed anything hitherto attempted.

It has been made of the machine which is known as the "Radio Telephone Transmitter," and it is said to have two great features. They are now being manufactured by the Radio Telephone Company, and a corporation has been formed to license and sell the instruments. Companies will be organized in different cities on the lines of the Radio Telephone Company, only the company will put up the main plant, and the customers will put up the rest to their own satisfaction. The main office is in New York City, and Mr. S. K. Smith, the division superintendent of the Union Pacific Railroad, is the one who is in charge of the company. It is said that the company is now in the process of being organized, and it is expected that it will be in operation all right at the time, the company will probably adopt it instead of the one which is now in use, as it possesses so many advantages.

Although deaf people seem to be few in number yet take them throughout the world and the aggregate will be found so large that I predict, it will really accomplish that which Edison claims—the deaf will be made to hear—that he will realize from the invention quite as large a fortune as he has from his greatest inventions. All of which I have from a private source, and am the first to convey the good news to the public through the columns of the **EXCERPTOR**.

From the \_\_\_\_\_  
Published at \_\_\_\_\_  
Date \_\_\_\_\_

—Sir, Thomas Iredy of New Britain, Ct., recently patented a very valuable and convenient addition to the electric light apparatus. One of them was recently tried in Hartford and gave great satisfaction. The patent is coming into general use throughout the country. It is said that Mr. Iredy refused to sell a share in the patent for \_\_\_\_\_

Number of article: 142057  
 from the: WZLH Inc  
 published at: Yellow Springs, Ohio  
 Date: May 21 1957

## THE PATENTS REGULATIONS

(Translated from the *Nichi Nichi Shinbun*.)

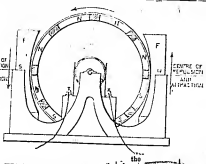
The Japanese Government published, on the 1<sup>st</sup> of the present month, by Imperial proclamation No. 7, the Patent Regulations, consisting of twenty-eight articles. It need hardly be explained on these days that Patent Law is a necessity for the encouragement of inventors, and for the protection of their reputation and interests. Our Government was cognizant of the importance of these Regulations long ere this time, and even published rules respecting patents in April, 1871. The title of these, however, separated from the Restoration on the 1<sup>st</sup> of a few years, and the intellectual development of the people was yet incomplete; and while preparations were yet nigh on the part of the Government for the granting of patent rights, the public mind was not in a faint impression of the benefits of such a measure. This fact led to the repeal of the rules in March of the following year. Nevertheless, it has never been denied that the Government has fully intended sooner or later to grant patents for new inventions.

Long experience has established the theory that the Japanese are by their second nature initiative, but are deficient in constructive genius. This is, however, only a generalized statement. There are, of course, numerous investors in the Empire. It might be reasonable to expect that investors actually ought to know their constituents, and that they are usually by educated, they will always find the constituents' interests for the public, without their obtaining any remuneration. Even if they kept their investments secret, and only circulated them after the fact, large stockpiles are sure to find themselves in the hands of the public. The sale of the original articles. A system of patent rights is, therefore, of paramount importance. The encouragement of inventors; and the more must this be the case, in a country like Japan, where the people are skilled in imitation, but are not endowed with a comparatively small measure of originality. The present regulations cannot be said to fail to give the public encouragement to undertake of new inventions, while providing against all chances of loss by imitation.

After the rules respecting patents were abolished in 1871, no law has been stated above, the Publication Regulations were issued, by which copy-right, lasting for thirty years, was wanted to all publications, translations, and topographs. Several persons have since appeared against infringements of their rights thus secured, and publishers and authors have derived little benefit from the regulations. Publications and translations, however, belong to the field of general learning, and there are numberless

menters concerned in addition to those things. There can be no doubt that after the enforcement of the new Patents Regulations our artists and manufacturers will show a marked improvement; just in the same manner as the establishment of the copyright law has brought about increasing degree of prosperity in the literary profession and in the artistic world. We hope that the public will not rest content with merely obtaining patents for the exclusive appropriation of profits on their labour, and the consequent under-estimation of the value of their cheap and undervalued inventions, just as so many of our writers are inclined to do when their works are published at present. The community must direct its attention solely to questions of practical utility, and endeavour to enjoy the benefit of the regulations to their full extent. As to the relative merits of the two systems as compared with those of Europe and America, we shall have occasion to speak in a future paper.

Character of article *Rep*  
From the *World of Science*  
Published at *London Eng*  
Date *July 17, 1985*



GANT'S PATENT ELECTRO-MOTOR.

[illegible]

This difficulty is insurmountable wherever the only source of power is that of the generating station. Such cities as Chicago, St. Louis and Kansas City may therefore be excluded from the number in which electricity could be profitably employed in manufacturing. It is only where water power is available to generate the electricity that the latter can be applied to manufacturing. From the foregoing it has been said with regard to steam, it will be seen that there is no gain from the use of electricity where the power source can be applied immediately to the use of the machinery in the factory. The question arises only from the fact that the electricity can be generated wherever the power is found, and then transmitted over long distances to manufacturing establishments situated at a distance. Herein is the great advantage which Denver may enjoy over Chicago and St.

MM. Crova and Garbo claim to have discovered a means of determining automatically the exact amount of energy stored in electric accumulators and so regulating the discharge to be able to ascertain the quantity of fluid in reserve at any given moment. The machines used in their experiments were of the Plante storage type as made by the Faure

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Character of article *Ed.*  
From the *Independent*  
Published at *Schaffersville, Pa.*  
Date *June 18, 82*

## NEW USES OF ELECTRICITY

The possibilities of electricity have been known to most of science for many years but its actualities are only lately being fully appreciated. It is now being introduced into almost for a great variety of uses, especially in the home, and is becoming a motive power and a means of transportation. It has replaced the oil-lamp candle, and there are no longer any lamps in which the flame of a gas or oil light can be carried in hand and is so resilient that lower can be continued to burn in the most violent commotion. It is used in the most delicate of uses in lighting; electric has long been used for the detection of the most serious results. It has diminished the use, for deeds of murder and robbery, and has been the cause of the cover of darkness. Statistics prove that crime of all kinds has diminished since the introduction of electricity. There have been few lighted automobiles and great interest is that plant life thrives but under a continuous electric light. The use of electricity in the home, the plant is necessarily intermittent. Plaster, it should be to require, require moisture, heat and light. The future of electricity has been noticed that—falsely suppose

to the midland sun of Norway, was exceptionally bright and vivid, due to the fact that the sun shone for half the year to almost ten days of the great lunary. It is now suspected that in hot houses and conservatories the use of electricity after the sun goes down will produce remarkably results in way of plant development, notwithstanding the fact that it is hardly thought to light by this subtle power of nature. Scientists tell us we now know only the A.P.C's of electricity. When all its factors are combined for the use of man there will be created for him a new and wonderful environment.

Demores's Monthly.

Character of article *Ed.*  
From the *Press*  
Published at *Newark N. J.*  
Date *Aug 27, 83*

## ELECTRIC LIGHT EXHIBITION

[illegible][illegible]

The importance of these suits is even greater than that of the suits to determine the telephone patent priority rights, since the incandescent electric light will eventually supplant all other forms of interior artificial illumination.

Character of article *Original*  
From the *Inquirer*  
Published at *Philadelphia Pa*  
Date *Aug. 13. 85*

**Mitglied:**

The Hinge Avenue Passenger Railway cars have interrupted the American Railways Co. service between the city and the waterfront since the cars were damaged in a fire. The cars were damaged in a fire which occurred on the night of the 10th. The cars were damaged in a fire which occurred on the night of the 10th. The cars were damaged in a fire which occurred on the night of the 10th.

Character of article: *221*  
From the *Sci.*  
Published at *Hornellville, N.Y.*  
Date *Feb. 27, 1881*

One of the most convolutions among the various contrivances which have been brought forward as auxiliaries to the foregoing English device, enabling the sender to encipher his message, is known under the name of the "rotor," or, to know whether, on making contact the belt actually rings. Beside the press buttons, and let into the wall, is a double letter-receiver, consisting of an electromagnet with a soft iron armature free to vibrate over one of thirteen, the scanning or "reading" of the message being employed instead of the diaphragm armature. This electro-magnet is formed up in circuits with the belt and battery, so that when the belt is in contact with the contact, carrying the current the telephone or electromagnet will emit a musical note or hum, which, being heard by a person listening, will inform him whether the belt is ringing as usual supposing, of course, that the current is strong enough.

The latest thing in electrical invention is the electric-light carriage, which is being tested in Philadelphia. The idea is to transport a weight up to 800 or 1,000 pounds in packages upon cables strung on wires, like electric lights wires, by means of electric motors. Two cables are used, one above the other. The packages follow suspended from the upper and are kept from swinging and the cables serving as conductors. The lower, however, is a thin wire. It is said to be in use in a New American mine. The Cincinnati Commercial Enquirer says: "The Cincinnati tried upon the tomorrow morning will show the telegraph and telephone wires high above the street streets of that city, and the image of the electric light in his mind—a network of wires reaching out to the surrounding hills, by which the electric men shall speed horses, each in his own wire cage. Travel thence will be lightning speed." The en-

**Moving Use of the Electric Light.**  
Important experiments were made  
few days ago in the torpedo station  
Newport, R. I., to determine  
which is used at sea as the search light,  
can be put in port or starboard well  
The mechanical portion is operated now  
by electricity, as well as the light, and  
is thrown from the other end  
to the other the light exhibits  
and experimented with was of  
15,000 candle-power. It was thrown  
downward, and the smallest boat in the vessel  
was picked out from the most remote  
point. Then the light was turned  
toward the inner harbor, and that, with  
the city's harbor, was scanned rap-  
idly and with a perfect success, every  
object, even the smallest, being picked  
out. Several officers of the torpedo sta-  
tion participated in the experiments, and  
pronounced them most successful.

[illegible][illegible]

The exhibit of the Edison Electric Light Company of New York City, at the International Exhibition, Philadelphia, is representative of having been of great magnitude and of surpassing brilliancy. The New York Graphic devotes two of its large pages in illustrating the various devices brought into existence through the inventive genius of Edison. The illustrations comprehend a portrait of the inventor, his home and laboratory, at West Orange, New Jersey, and a host of other interesting particulars, together with numerous sketches of the present equipment of the various corporations manufacturing enterprises connected therewith. The inventor is too well known to need any further introduction than the mere mention of his name.

Character of article... *The*  
From the *Times*  
Published at...  
Date... *Feb 2 85*

## Edison's New Invention

[illegible][illegible]

**Edison's New Invention.**—The  
 of Thomas Edison's new inven-  
 experimenting during the last four days with  
 on the status of the States being  
 Italy. The new device is in-  
 tially to permit engineers to com-  
 municate easily with one another when  
 in a safe airport and in the  
 medium of a telephone. The telegraph  
 line along the railroad and an instru-  
 ment of communication.

The appliance is designed to pre-  
 serve the fidelity of the weather at  
 in some respect. The appliances are the in-  
 vention of the inventor, who has been  
 communicate with apparatus of the in-  
 a matter in what speed they may be rendered  
 The United States is now in the  
 good deal of secrecy. Mr. Edison has  
 the United States foreign parties before making  
 anything and he has no prospects to have  
 it completed in about two weeks.

Edison, the real inventor of electric lights, loses his legal claim to priority in the incandescent lamp, owing to the shrewdness with which he perfected his discovery, and others got in ahead. The legal controversy between Edison and Sawyer has been going on for five years, and now the Commissioner of Patents decides that the Sawyer invention was perfected in March 1878, and Edison's not before October 1879. The company that now holds the patent is the assignee of the original inventors.

COOPER & CONANT'S Dressmaking is conducted by people trained in Parisian schools.

May 11/55

"When will the exhibition on the Second avenue 'L' begin?"

"Not later than the middle of June, I think. The trucks of the first car are so nearly equipped with motors that the trucks will

**An Electric Phenomenon.**  
When the connection of the

[illegible]

**OPTIC LIGHT PATENTS.**

GUN BY THE EDISON COMPANY.

one effort on the part of the owners of the Edison patents to prevent the manufacture and use of any in-

Mr. Tolmison, the company's spokesman, said that additional suits would be brought against users of the alleged infringing tools.

## THE ELECTRIC LIGHT WAR

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interested in having the underground wires,  
required in Philadelphia before January  
next, placed in the best possible manner.  
ngo in your address.



[illegible]

Mr. Edison, who is entering in his experiments, has made an improvement in his quadruplex instrument, which enables him to operate at any station to break in at any time and have a portion of a wire for his particular current that is already being used by eight or nine operators at either or both ends: Mr. Edison takes the Western Union \$10 a year for each station at a royalty on the patent he has already

[illegible]



Character of article, *Ed.*  
From the *Union Republic*  
Published at *Winston N.C.*  
Date *July 9, 1885.*

The latest thing on electrical inventions is the electric-light carriage or "telephone" system, which is being tested in Philadelphia. It is a transverse pulley suspended from 800-ft. wires, and the car is suspended from the pulley by means of electric motors. Ten cables are used, one for each wheel, the pulleys being suspended from the upper and steeled by the lower, and the cables serving as conductors. The invention is English and is said to be in the hands of the Admiralty. The *Clarendon Commercial Gazette* wants this system tried upon the towing tugs which raise the telegraph and telephone cables to the light, and the *Independent* says that the imaginative editor even sees in his mind—a network of private lines reaching out to the marrow and the marrow to the marrow and the marrow to the marrow. Fourth street and the "barbarian houses, each in his own way." Travelling "by actual lightning" expresses the enthusiastic *Illustrated*

### Character of art:

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change in your address

Character of article... *Ref.*  
From the... *sentinal milwaukee*  
Published at... *Milwaukee*  
Date... *July 9 1843.*

A MAGNETIC TELEPHONE.

[illegible]

20 Please keep this office advised  
change in your address.

Character of article... Edit.  
From the Free Press  
Published at Free Press  
Date July 4/19

## EDISON'S LATEST IDEAS

It was rather a wild experience meeting him there in the great grain building, where there are but men besides himself, at night. We today engaged in a most interesting telephoning, from railroad to railroad. This is not to be done in cable link along the track, on the telephone, but by throwing the current, by induction, from the wire alongside the railroad. The experiments have already shown the sparks can be thrown 180 degrees. The regular machinery, of course, appliances will be used. It is to be grounded in the wheels of the car, and on the top of the wheels will be condensers of tin plates upon which the electrical arrangements are also progressing. An experiment in telegraphing by same method from one ship to another.

"But is that possible," I asked. "How far do you think you can throw the current over the water?"

"I'm afraid to say how far," was the answer. "From the data already obtained, the theoretical conclusion is that we can throw it twenty-miles. Possibly we can throw it more than that."

Then Edison rapidly sketched paper a map of the two continents and the Atlantic, and then a plan of telegraphing from ship ship so as to establish certain communications between the two parts of the frequented seas. Not content with this projected miracle, which was to be near fulfillment, he also busied himself upon a marine telegraph. This method is generally in vogue of reckoning with the aid of a mirror, which is thrown upon a mirror is magnified, as shown on a diagram, and the reflection of the number of dots indicating letters can be judged by operators from a distance of some three or four miles. Even the siphon record is used. Sir William Thompson used the two of the new cables, is the telegraphical, and is the best of the pretty narrow. Edison is to devise some means of attaining the same or better results at a speed so close to the record as to be almost clear. But "it's a long haul."

Perhaps the most interesting thing he had in any way responding his explanation for a "new force." At present he tells it simply x y z. He does not pretend to know what it is. He says that there are many phenomena which are not explained by the force yet recognized, and it is these which he is going to investigate. Vibrations of matter at the rate of 80,000 a second produce the highest sound we can hear. Between the

and the vibrations which at the rate of millions per second, cause the sensation of heat, there is a large gap, and between those and the vibrations which give sensations of color there is another gap. These gaps, Einstein believes, will be filled by the new, as yet unnamed, which constitute the new, or unnamed, force he is in search of. He brought out from a drawer snarling loose shoos on which he had sketched a number of machines he had projected, and said, "I don't know if they are still undefined, 'I just threw down as they occur to me," he said, "and when I get enough of them together I shall into the machines made and try to generalize my observations."

every century who dares believe in any discovery beyond all discoveries. Horacio is a student of nature who is not afraid to have the spirit of a Galileo or a Kepler. He shall learn from him that in retreating into faith and insight, aided by bold and patient experiment, we may go forward. You think as to the nature of matter? I lacked, miserably. The answer was prompt: "I do not believe that matter is composed of atoms, but of solid force. To me it seems that every atom is possessed of a certain amount of primitive intelligence. Look at the hydrogen combine with these other elements, forming the most diverse substances. Do you mean to say that the atoms are not intelligent?"

When they got together in certain forms they make animals of the lower orders. Finally, they combine in man and form the total intelligence of all the atoms.

"But where does this intelligence come from originally?"

"Do you then believe in an intelligence, a personal God?" was the next question.

"Certainly," said Mr. Edlemon. "The existence of such a God, in my mind, can almost be proved from chemistry."

[illegible][illegible]

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Character of article.....  
From the.....  
Published in.....  
Date.....

## LIGHTING UP OLD OCEAN

[illegible]

change in your address:

Character of article: Report

From the: Times

Published at: Pittsburg, Pa.

Date: June 2, 1888

### The Surprises of Recent Progress

The recent exhibition of his new forces in the Hotel Imperial Hotel, in which he had been so successful as to receive the most complete and complimentary of his audience, among which were men competent to judge of the merits of the liveless shows, will tend to smooth the way to belief in "faith cure," and to assist materially to the fallaciousness of credulity. If Koely shall be pronounced an unqualified success after all the years of labor and doubt, and ridicule which have been heaped upon his scientific polli, then the individual who shall hold that anything is beyond science and art, will be regarded as a cynic when it shall appear that he has been so misled from complacency. Still, it is well known, the early death of Koely decided, and the man who suggested that the vapor from hot water could be utilized as a force, was dropped into a local asylum.

Two years ago an individual proposing that the telephone would have been regarded as a fit subject for a writ *de hominibus legibus et rebus*, if he had any property which might be considered by the law as a subject desired to confute. Keogh has escaped the innate asylem, but he would have been there had he lived two centuries ago. Had he been a New Englander of the early Colonial days the probabilities would have favored his strenuous efforts to company with the wileless of Nowhere. The telephone inventor would have been driven to the madhouse, and the electrician who got the plug and the telegraph simultaneously served as a madman either way on the same wire would have been cruciated alive.

This is indeed an age of surprises, one lives here in seeing and learning in 10 years now than he could have done in all the centuries previous to the nineteenth. Reed, will have accomplished one of the greatest wonders of the century. If he shall improve upon the motor, an expectant people may well look forward to his devising a system, or force, or something else utterly unheard of, undreamed of, and at present beyond even the scope of the most capacious imagination—equal perhaps to the task of securing to this Administration the Democratic vote in the South who have not been rebels, horse thieves or negro

Change in your address. \_\_\_\_\_  
Character of article. Ed  
From the Times  
Published at, Philadelphia  
Date June 17, 1891

## Stop the Overhead Whore

The Mayor's veto of an ordinance authorizing more poles and wires for electric lighting is entirely to be commended, although the reasons which he gives are somewhat inconsistent and not clearly expressed. Whatever question there may be as to the policy of compelling an immediate removal of all trolley and telephone wires, there can be no reason for multiplying overhead wires for the electric light. The practicability of laying these conductors under ground has been fully demonstrated, and no also has the danger as well as the unsightliness of those carried overhead.

The obstacle to the underground system is not only the cost, and the electric lights and computers are going into this business as speculation, and as they must ultimately be compelled to bury their wires, there can be no inquiries in making them begin now. The Council three years ago ordered that there should be no more poles or overhead wires in the streets after the first of January last, and if they had stuck to this position we should have been better off.

Since the operation of the ordinance has been postponed the prospect of relief appears remote, but it in no way legally follows because the wires are not removed that additions to them must be authorized indefinitely. If we cannot get the existing wires removed at least let us have no more of them. The Mayor would have done better to make his veto unqualified. The way to get the wires underground is to forbid their being erected overhead.

Character of article: *Original*  
From the: *Philosophy*  
Published in: *June 1955*  
Date: *June 1955*

### MAYOR SMITH'S FIRST VETO

### He Withholds His Approval to an Election

Mayer Smith sent to Councils yesterday the following veto message, which was sustained by Select Council. In the lower branch a new bill was introduced, which meets the Mayor's objections:

**MAYOR'S OFFICE, June 4, 1885.**—To the  
 Mayor and Common Councils of the City of  
 Philadelphia:

Gentlemen: I beg to return without my approval  
 "An ordinance granting the Thomson-Iveson  
 Electric Light Company permission to extend its  
 lines by electric poles and wires on Girard avenue,  
 Fairmount avenue, and on Spring Garden street."

The general reasons for the non-approval of the  
 bill are as follows:

Under the ordinances approved June 10, 1882, Cocoonis declared "that it shall be unlawful and after January 1, 1885, to erect or maintain any poles and wires for telegraph, telephone, or electric light purposes in the streets of the city of Philadelphia."

While willing to concede that it may not be wise nor reasonable to exact any such far-reaching action, it is, beyond doubt, both to the interest of the city and the benefit of her citizens, that due care and precaution be given them in the preservation of their lives and property, and no destruction of the overboard system of poles and wires is so absolutely dangerous as the system of oleoite lighting.

Desiring to afford the present corporation an opportunity to avail itself of such privilege as your honorable bodies may deem wise, I would most respectfully suggest the following modification in the ordinance, which will make it more acceptable, namely:

The omission of the service from Second to Sixth streets upon Grand avenue. A line of wires being already constructed.

Previous should also be made whereby companies or corporations seeking such privileges from the city should be required to furnish city lights at the figures determined upon per decomposition.

Courts have likewise enacted in section 6 of the ordinance of March 10, 1882, "regulating the introduction and providing for the embargo, for underground, underground, or overboard wires," that have been used to connect the various buildings.

that a bond shall be filed of record conditioned that all corporations, firms, or persons will comply with the provisions of this ordinance and of all other ordinances now in force or hereafter to be passed. This company have nothing required, nor have they filed any such bond as is contemplated in the ordinance quoted.

Another decided objection to the ordinance is the fact that there is nothing either in the title or body of the ordinance which indicates that it is

most of the ordinances to define or limit the privileges granted. Whilst it may be affirmed that electric lighting is the actual scope and intention of the company, the ordinance is so general and entirely without any specific utterance of its intention and desires as to warrant in asking that its purpose and functions be clearly and plainly defined.

the property of her citizens, which is much improved and aided by the introduction of an ample and good system of lighting the highway, will warrant my approval of this ordinance if your honorable body may admit after consideration the wisdom of some of the suggested modifications, but I must clearly and unequivocally express the belief that from and after the present time the executive position will best advise the

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100% 90% 80% 70% 60% 50% 40% 30% 20% 10% 0%



100% 90% 80% 70% 60% 50% 40% 30% 20% 10% 0%

[illegible]

THE BRIDE OF TEENING: Edison's ever native. He has succeeded in perfecting another invention—one that will enable engineers of trains to communicate with each other while the trains are in motion, and at least a mile apart, the medium being the telegraph wires along the line of the railroad, and a powerful instrument in the cars. It cannot but result in a great saving of life.

Improved thermo-electric piles of the Clamond and Charpentier type were recently exhibited before the Academy of Sciences, Paris. The couples were of iron or nickel and an alloy of antimony-bismuth. One pile consisting of 12 sets of 10 elements gave an electromotive force of 8 volts and a resistance of 0.2 ohms, while another half that size gave nearly the number of elements gave 32 volts with a resistance of 0.03 ohm.

One of the aims of Mr. Edison's inventors is intended to permit engineers of trains to communicate easily with one another when the trains are a mile apart and in motion. The medium of communication is the telegraph wires along the railroad and an instrument in the engine-room. The appliance is designed to prevent collisions in foggy weather at curves or on terminals. It resembles the telephone in some respects. Flags and signal-wireless can also use the instrument to communicate with approaching or passing trains, no matter at what speed they may be running. Two trains that heretofore have been connected with a good deal of secrecy.

—Mr. Edison, the electrician, says that the  
are electric light is unsuited for lighthouses  
because it lacks red and yellow rays. He  
adds that all other lights are deemed for  
lighthouses, excepting the incandescent elec-  
tric light.

[illegible][illegible]

*The Airs Electrically.*—Prof. Palmieri, of the Vatican Observatory, finds that the atmospheric electricity is usually positive in clear weather. If negative, a fall of rain may be inferred to be in progress at some little distance. Two maxima and two minima, daily are noticed in the electric indications, this periodicity being disturbed by atmospheric movements. With dew, rain or an event of wind, the indications increase in intensity and are stronger in spring and autumn than in summer and winter. A rain zone is positive, but is surrounded by a negative zone, which in turn is surrounded by a zone of positive electricity. Thunder and lightning, according to this observer, do not occur without rain.

**The Coming Storm.**  
In obedient disciples and in the practical application of electric force the United States has, generally speaking, been distinctly in advance of the rest of the world. It seems, therefore, a little strange that electricity has not made greater progress among us as a motive power. One of the reasons for this is, experiment shows, has to do with the "water line" in this city. During the past week people have been sent along the lines for the support of an electric cable, and in a very few days they will enjoy the novel experience of propelling by electricity. There seems to be a general belief that Mr. Charles Venable, who makes the undertaking at his own risk, will soon be successful.

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Date \_\_\_\_\_

Journal of Management Education 32(10):1131-1144

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**Index**

may offer, as Mr. Cloudman believes, no insurmountable engineering difficulty, and if no part does so the whole need not.

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ing in contact with the wires.

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These dynamite will be driven by two trains, one of which of 165-8000 voltages, and the other of 110-8000 voltages, all of which will be used with the no. 110000. The other will be of 80-8000-voltage, and will be in place in a few days, the foundation being ready for its reception. The dynamite will be connected from the dynamite to Third and Kington by two copper wires called the main, which are each 5/16 inches in diameter. From these main wires will be made by smaller insulated wires called the branch, and from them in turn a 3-16 inch diameter wire will be used to conduct the current into the lamps. The wires will be above the lamps and in other places will be connected to this latter wire by an insulated shell covered with cord similar to that used on galvanic batteries.

[illegible]





The experiments at Paris, which have succeeded in transmitting electrical power a distance of thirty-six miles, with a loss of only fifty per cent., show an important step in advance. In other words, eighty-four per cent. of electrical energy at the transmitting station becomes forty-four per cent. at a distance of thirty-six miles without undue heating of the dynamo or the conducting wires. The question of economy in production or the cost of transmission is not made clear in the report. But as the loss has previously been about two-thirds, the progress shown by this experiment affords a promise that the utilization of electrical power may soon reach entire success.

[illegible][illegible]

Professor Johnson asked one of the white men, "It is a pity, or is it not, that the machinery got out of order, wouldn't it touch water?"

"I don't have any objections to your asking questions," said the Professor, "but all the questions are the owner's questions. Well, the owner told me that I could have given you as much valuable information. I must decline to say more."

"Professor Johnson," explained the landowner, "naturally," "two men do not outstep one in this. We are used to being taken into the hiding place of your thoughts and your plans." The meeting was thus terminated.

The Professor has decided to remain in the city for a few days. He proposes to hire a public hall and give a lecture on "The Hiding Place of the W-d."

[illegible]

**Electric Lights in Evening**  
The Kalamazoo Electric Light Company  
is lighting the evening schools by  
wincor. The School Commissioners  
had an introduction to the Evening  
an experiment, and it is found it  
probably has all the evening schools  
of the city.





99





Dy

**The Telephone**—It is of great importance to settle legally the question whether the patent on which the systems of the American Bell Telephone Company are based were rightfully secured by Alexander Graham Bell, or whether they were obtained by him through the power of that company. It will be only the first step, though the most important one. We have in the Western Union Telegraph Company and the Standard Oil Company illustrations of the fact that patents are not required to a monopoly. Next to the protection of the Government in some such form as a patent, shrewd business management and an unscrupulous determination to keep everybody else out of the field are the essentials. And the successes of the Bell Company are due almost as much to business management as to the patent.

[illegible]

The Telephone Company will stand out in history as the greatest of American humbugs.

The concern has no more capacity for "fine work" than a hobo. It holds its charter under a "patent" from the State of New York, the present year, when the Legislature of that State refused to allow it to increase its capital stock from \$10,000,000 to \$20,000,000, and it has been forced to pay the State for the right it asked for. One of its greatest triumphs was the refusal in 1903 of the provision in its charter forbidding it to hold more than one per cent of the stock of any company, and the consequent sale of the stock, which telephone business of the country by the throat. Its success in this line has done largely to its patriotic zeal in the purchase of the Government bonds, and the appointment of the committee.

It enjoys a comfortable exemption from heavy taxes in that State too, and that is the result of its success in the peculiarities of the law. It paid \$100,000 in taxes in 1903, and \$100,000 to expose its wealth to the public view. The patents provided for \$50,000,000 a year in 1893 were put in at \$5,000,000 in 1895, and \$5,000,000 in 1903. It has been able to turn up \$2,000,000 in profits in 1903.

It is a fact that has not seemed to occur to anyone that the telephone is a means of communication, and, as such, is attacked by the enemies of the press. It is a fact that the telephone is a means of communication, and, as such, is attacked by the enemies of the press. It is a fact that the telephone is a means of communication, and, as such, is attacked by the enemies of the press.

Date \_\_\_\_\_

[illegible][illegible]

Date \_\_\_\_\_

The idea that these variations in the same whose opinion was entitled to respect last night in the Birmingham pressure very accurately the intensity of the light-house illuminance. The second part of the Trinity House Committee's report, as given by Mr. Motz, was that the interesting experiments have recently been made to ascertain the effect of different naphtha pressure on the pressure standard flame deviated by Mr. Croft of different naphtha in a mean of measurement in photometric trials. To test the matter fully Mr. Harcourt proceeded to burn 100 lbs. of naphtha of four thousand four hundred testbaars or more. The result on the mountain test was that the variation in illuminance was 10 per cent. more, due to variation of harmonization of flame, was less than had been anticipated, and that the required no correction for such variation is necessary for the photometric results obtained at the South Pole.

55 so as these experiments have been  
 60 since the results have been satisfactory.  
 65 The question of how to make atmospheric pressure  
 70 changes less noticeable to diminish the visibility  
 75 of lights is, however, of great interest,  
 80 and it would be well to make exhaustive  
 85 experiments to determine exactly what the  
 90 variations are with varying readings of the  
 95 barometer for lights used on lightships and  
 100 lighthouses, not to publish them. These  
 105 variations no doubt are small, but the  
 110 knowledge of them by navigators would give  
 115 them greater confidence in the lights by  
 120 which they are guided and make them have  
 125 a better lookout for the friendly red  
 130 light.

[illegible]

Due







Probably The Guarant was the first newspaper in this country to herald the advent of electric

[illegible]

Yet how little has been accomplished to that which remains to be done. The fact that over one half million electric lights are in operation in this city is proof that the candle light lives a woe of the people. It has clearly demonstrated the need

[illegible][illegible][illegible]

that the American people would make of it. I have no doubt that the people of this country will have a very different view of the situation than the people of the world. I have no doubt that the people of this country will have a very different view of the situation than the people of the world. I have no doubt that the people of this country will have a very different view of the situation than the people of the world.

[illegible][illegible]

A decidedly flattering result is learned an inquiry to John R. Fletcher, Secretary and Member of the Chicago Daniel Webster League Committee, who stated that the "light" machine was "a marvelous contrivance" and that "it is the only one of its kind in the world." The machine was "entirely satisfied with the light and noise produced."

From the 27th Gr. L. 1898

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HOW THE GASES ARE TO BE EXPLODED AND THUS  
DRIVE THE PISTON ON NEW WAY.

Mr. Seese's little craft, the Eureka, which was launched recently from Pollack's shipyard in Brooklyn, is in the water like a duck. All the wonderful engineering which, according to its inventors, is revolutionizing the machine world, is in it packed into a hull no larger than a bathtub. When the Eureka renders her "all down for the stars" but when the water tanks and other things that are to be stowed forward are in place, she will be hunched to her waterline. Due to a perfect copy of the steamship America, reduced "eight fold" into a microscopical world as they call it, her builders hope to have her in order for a trial run by New Year's Day. Through her main hatch a small tubular ladder can be seen, but the rigidly constructed "No Admittance" prevents further examination of her machinery. In substance the latter consists of the following parts:

The steam furnished by the boiler is supplied to one or more little engines which drive an air compressor rather complicated system of valves and a little dynamo. The hydro-carbon gas can be manufactured so soon as by vaporization of petroleum by a lot of steam or by fermentation of a supply can be taken from the shore and stored in tanks. The fuel of the machinery is the same as that of the ships. The water is pumped out of the sea by a small pump leading from the pump to the side of the vessel. One does not go backward so that the charge from their mouths is toward the stern of the vessel. The water is pumped out of the stern of the vessel by the aid of a pump which pumps up the water, the water is pumped out from there is directed forward. The action of the force will naturally be to drive the vessel forward. The water is pumped out from the stern of the vessel and the water is pumped out from the stern of the vessel and the water is pumped out from the stern of the vessel.

[illegible][illegible]

representatives of Washington to investigate the  
combined together its possibilities as a system of prop-  
erty for war vessels are attracting much attention.

From the *Journal of the*

1997

DATE 11

**Chairman Noyes Thinks the Compa-**

General Manager Sawyer's Answer  
to a Reporter.

Yesterday morning, a reporter for the **Times** called on Mr. Noyes, chairman of the city commission on electrical appliances, and asked him what the company was doing in answer to the notice served on them by the city, if they had made any answer. The reporter told Mr. Noyes that many people believed that there was no foundation for the company's statement that lawless people and their wives, and that many thought the company had no power enough to fill the contract with the city.

Mr. Noyes said he had made careful investigation. He was satisfied the company had ample power, and that he knew the statement made by the company about their wires was true.

The reporter then sought an interview with General Manager Sawyer, of the Electric Light Company, and the following questions and answers were put and made:

**Reporter**—Mr. Sawyer, there has been a great deal of public comment on the recent failure of light, and it is believed by many that the company's works are not adequate to fulfill the contract with the city. Is there ground for truth in this

the lights. *Source:* The contract of the company with the city calls for 150 arc lights, and 250 incandescent. All but five of the arc lights, and eight of the incandescent are in position. These will be placed in position immediately, and until they are erected the company pays for all expenses incurred for lighting in these places, under their contract. *Source:* The city has no exposure outside of the contract. The city pays for the electricity and the arc lights. The company keeps in constant reserve one spare machine and engine. The company has three street lamps, and the third one was brought into use only after Dec. 1st, and then only in case of injury or lack of strain in the city. *Source:* The city has the custody of the works, and amount of power produced by the company is nearly double what is required by the city contract. In addition to this, to show the company's good faith with the city, they are running 102 incandescent lights—over 50 arc lights—and not to offend the station I have many orders to be filled. *Source:* The city will accept, which would interfere with arc work.

Hepter—how is it regarding the incandescent light?

Mr. Sawyer—They have caused as much trouble from imperfect insulation, and the matter has been brought fully before the American Edison Company of New York, who are pulling in the same. I received yesterday a letter on this subject from Mr. Johnson, president of the Edison Company, from which the following extracts may be of interest to the Portland public:

THE EDISON COMPANY FOR INSULATED LIGHTING, 60 FIFTH AVENUE,  
NEW YORK, Dec. 14, 1888.

Dear Sir: Your favor of the last date containing the

Very satisfactory results at the stations at Portland, Ore. and here and is now receiving our best attention.

The fact is, could we begin to get reports from your work at Portland we were without any means of knowing positively whether the various means provided to affect the work in view of our activity.

Immediately upon receipt of these reports, we set about correcting the defects they brought to light. Many of these were of such character as to require slight modification but in the aggregate they were of such importance that we have been forced to make a decided change as to justify a reworking of the mechanism of the lamp and the installation of the dynamo. Prior to the receipt of your letter and during the whole of the past season we have been unable to get any reports from your station.

SECRET

There is absolutely no radical defect in the system. It is simple and an aggregation of little things that only experience can bring to the surface.

Disregarding the circumstances of these things and the dire results so much as you can understand.

**Reporter**—Do you ever have trouble with the telephone and city wires?

**Mr. Sawyer**—We do. This is caused by the stretching of the wires of the various companies, and sometimes we have to disconnect a circuit temporarily to remove the trouble.

**Reporter**—Are you doing all you can to fulfil your contract with the city?

**Mr. Sawyer**—Yes, often to this extent: We are running extra wires, often at great expense, as far as possible for putting every electric light on the principal streets on different circuits, so that if one circuit is interfered with every other circuit will burn, and I will say here, that it is the desire of the management to be informed by any citizen of the extinguishing of any light, by immediate telephone notice to the office where a sufficient force is constantly on hand to remedy the difficulty.

After having invented a machine that enables people hard of hearing to hear clearly, Mr. McLean has invented another that will aid deaf-mutes to hear the human voice. This is an alarming fact, for the new invention is in use in general use among street vendors, shouting stump speakers, religious orators, and people generally who place value on sound than on sense. We believe that this machine would be the McLean family far, as they appear to have difficulty in making themselves heard without the aid of acoustics and speaking trumps.

[illegible]

ARTICLES of incorporation have been filed by Thomas A. Edison and others, at Albany, N. Y., of the International Railway Telegraph company, which is to introduce his device of telegraphing to and from moving trains. If this device can be put into practical use collisions could be prevented.

Among the attraction soon to be given at the Opera house are Daly's "Vacation" party, Gilmore's "Devil's Auction," "Brother Jonathan," Pauline Merkle's in light opera, Nell Burgess and Margaret Mather.

Character of article Gift  
From the Gift Shop  
Donation  
Date Jan 18-26

**A LUCID EXPLANATION OF ITS COM-**

Two gradual impositions of the Incandescent electric light by Pittsburgh and Allegheny has made it a familiar object to every eye. The glowing filament of the incandescent bulb is a source of glowing filament and attracts attention to the flickering gas jet. But the faint glances about the gas jet casually and generally are not the case with the incandescent light. It passes to many people. It produces light by incandescence. The molecules of gas are rendered red-hot and luminescent. The light is produced by the exhalation of other molecules. The blue portion of every gas flame is where acoustical vibrations are most intense. The blue flame which keeps the root in a state of incandescence by the friction of the air. The heat produced by the friction of the air is the cause of the gas to go through a two carbon filament, which is the cause of the condition of incandescence and produces light.

The three substances which enter into the composition of the incandescent light are: 1. A gas which is not a gas, 2. A gas which is not a gas, 3. A gas which is not a gas.

[illegible][illegible]

**Article Censored by Electric Lights.**

As a sequel of the First Communists' publication, a resolution was adopted on June 15, the anniversary of the Communist founding that steps be taken to remove the article which touches the Communist Party of the United States and its efforts to influence the Chinese. It was decided to request the League Board to forward a letter to the Chinese Communist Party in Peking, to inform it of the steps taken by the American Communist Party to remove the article from the anniversary issue of the Communist Party magazine, and to inform the Chinese Communist Party of the steps taken by the American Communist Party to remove the article from the anniversary issue of the Communist Party magazine, and to inform the Chinese Communist Party of the steps taken by the American Communist Party to remove the article from the anniversary issue of the Communist Party magazine.

# ELECTRIC LIGHT

TERMS AND PRICES "VARIOUS"

Sirasa, the oligur greenfinch, of No. 20  
1977, said that he had two lights from the United

plan for laying the telegraph and other wires below the surface of the ground.

the  
when  
this

will be decided. I don't know  
if the commissioners will agree to  
not, but I think they will. I don't

—

**Figure 1**





















[illegible]











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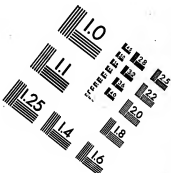
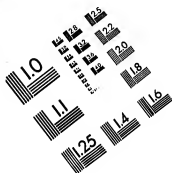
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